EPA/ROD/R04-00/027
2000

EPA Superfund
Record of Decision:

JACKSONVILLE NAVAL AIR STATION
EPA ID: FL6170024412
OU 04
JACKSONVILLE, FL
09/28/2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 2 8 2000

044

4WD

Commanding Officer
Naval Air Station Jacksonville
Jacksonville, Florida 32215-5000

SUBJ: Final Record of Decision
Casa Linda Lake (PSC 21)
EPA ID# FL6 170 024 412

Dear Captain Turcotte:

The United States Environmental Protection Agency (EPA) has reviewed the Department of the Navy's Final Record of Decision. (ROD) for Casa Linda Lake-Potential Source of Contamination (PSC) 21 at Naval Air Station Jacksonville pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended. The Selected Alternative, Alternative 2a, consists of Institutional and Passive Habitat Controls. The only concern expressed with this remedy was the concern that upstream contamination from a RCRA unit may, at some date, turn Casa Linda Lake into a RCRA Solid Waste Management Unit. With the understanding that NAS Jacksonville will prevent this from happening, EPA concurs with the findings and the selected remedy presented in this ROD.

Sincerely,

Richard D. Green
Director
Waste Management Division

cc: David B. Struhs, Secretary
Florida Department of Environmental Protection

Captain Richard E. Cellon, USN, Commanding Officer
Southern Division Naval Facilities Engineering Command

NAVAL AIR STATION JACKSONVILLE

Jacksonville, Florida

OU-4
FINAL RECORD OF DECISION
CASA LINDA LAKE (PSC-21)
AUGUST 2000

Contract N47408-97-C-0202

Prepared by:

ARCADIS
GERAGHTY & MILLER

Record of Decision

Casa Linda Lake (PSC 21)
Naval Air Station Jacksonville
Jacksonville, Florida

P R E P A R E D   F 0 R

Naval Facilities and Engineering
Command Service Center
Port Hueneme
Port Hueneme, California

Record of Decision

Casa Linda Lake (PSC 21)
Naval Air Station Jacksonville
Jacksonville, Florida

Prepared for:
Naval Facilities and Engineering
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Port Hueneme, California

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Our Ref.:
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Date:
August 2000

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LIST OF ACRONYMS

amsl	above mean sea level
ARAR	Applicable or Relevant and Appropriate Requirement
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COEI	constituent of ecological interest
COI	Constituent of interest
CWA	Clean Water Act
DPWP	direct-push well point
ELCR	excess lifetime cancer risk
ERA	Ecological Risk Assessment
ER-L	Effects Range ! Low
FDEP	Florida Department of Environmental Protection
ft	feet
FFS	Focused Feasibility Study
FS	Feasibility Study
HI	hazard index
HQ	hazard quotient
IAS	Initial Assessment Study
NAS	Naval Air Station
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No observed adverse effect level
NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
PAH	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PSC	Potential Source of Contamination
RA	Risk Assessment
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision

LIST OF ACRONYMS (Continued)

SARA	Superfund Amendments and Reauthorization Act
SLERA	Screening level ecological risk assessment
SPCC	Spill Prevention Control and Countermeasures
SVOCS	semi-volatile organic compounds
SWPPP	Storm Water Pollution Prevention Plan
SWPPT	Storm Water Pollution Prevention Team
TBC	To-Be-Considered
USEPA	United States Environmental Protection Agency

1. Declaration

1.1 Site Name and Location

Casa Linda Lake (also known as Potential Source of Contamination [PSC] 21).
Jacksonville Naval Air Station (NAS), Jacksonville, Florida, EPA ID FL6170024412.

1.2 Statement of Basis and Purpose

This decision document presents the selected remedial action for Casa Linda Lake (PSC 21) located on the NAS in Jacksonville, Florida. This document has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

This document is issued by the NAS Jacksonville Partnering Team consisting of representatives from the U.S. Environmental Protection Agency (USEPA), Region 4, the Florida Department of Environmental Protection (FDEP), and the U.S. Navy. Each agency has been consulted during the development of the selected remedy and concurs with this decision document.

1.3 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site.

1.4 Description of the Selected Remedy

This remedy is intended to be the first and final operable unit for this site. The purpose of this remedy is to prevent human exposure (fish consumption) and to ensure protection of the St. Johns River from the constituents of interest (COIs) identified in the environmental media in the lake. This remedy will also protect the neighboring wildlife habitat from the constituents of ecological interest (COEIs) detected in the media within and around this retention basin.

Major components of the selected remedy include monitoring with institutional and habitat controls as follows:

- Institutional controls comprised of use restrictions and advisory signs which are currently enforced by NAS for Casa Linda Lake;

- Monitoring of Casa Linda Lake in accordance with NAS storm water management programs, including the Storm Water Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs); and

- Control of the habitats in the vicinity of Casa Linda Lake via Passive Habitat Control.

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy does not satisfy the statutory preference for treatment as a principal element of the remedy because the COI and COEIs are more effectively remedied and result in lower overall risk exposure than alternatives that would disturb the lake sediments and mobilize the COI and COEIs. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern and their respective concentrations

- Baseline risk represented by the chemicals of concern

- Cleanup levels established for chemicals of concern and the basis of these levels

- How source materials constituting principal threats are addressed
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected
- Key factor(s) that led to selecting the remedy.

1.7 Authorizing Signatures

S. D. [signature]	6 Sep 2000
Department of the Navy, NAS Jacksonville	Date

2. Summary

2.1 Site Name, Location, and Description

The site is Casa Linda Lake (PSC-21) and is located on the Jacksonville NAS in Jacksonville, Florida. The Jacksonville NAS (EPA ID FL6170024412) is listed on the National Priorities List (NPL). The NAS Jacksonville Partnering Team is managing the site under a Federal Facilities Agreement. The U.S. Navy is the lead agency with support from the USEPA and the FDEP.

Casa Linda Lake is an 11-acre man-made surface water body surrounded by the Casa Linda Oaks Golf Course located at NAS. The lake is located at the north end of the golf course and is bounded by fairways and greens on the south and park-like open areas on the north. The 11th green is located on the small peninsula in the middle of the lake. The banks of the lake are steep and generally grass covered with occasional occurrence of a small tree. A map of the area surrounding NAS is provided as Figure 1. Figure 2 shows the location of the area of study, Casa Linda Lake.

Casa Linda Lake was constructed as a retention basin to provide storage of storm water from the northern, portions of NAS storm water Basin 17. The configuration of Casa Linda Lake is small with an approximate length of 1,800 feet (ft), an average width of 250 ft, and an average depth of 8 to 9 ft. Casa Linda Lake was constructed with a control weir (dam-like structure) to retain the first flush of a storm event. The considerable length (up to 1,800 ft) between the control weir and the pipes that funnel storm water into the lake allows sufficient area for suspended particles to settle within the lake and not be transported out of the lake.

The lake also provides limited habitat for fish, birds, ducks, turtles, and alligators. Additionally, water from Casa Linda Lake is used by the golf course for irrigation during the dry seasons. It is reported that the lake levels decrease dramatically during dry periods, yet the lake has never dried completely. The storm water is funneled into the northwest end of the lake near Birmingham Avenue and along the north bank. The control weir at the eastern end of the lake controls the lake level, with overflow spilling into a drainage ditch that eventually empties into the St. Johns River at Mulberry Cove.

2.2 Site History and Enforcement Actions

Casa Linda Lake was identified as a PSC during the Initial Assessment Study (IAS) conducted by Hart and Associates in 1983 because of a fish kill that occurred there on May 6, 1979. The fish kill was caused by applications of the pesticide Dasanit™.

Following applications of the pesticide between April 23 and May 3, 1979, heavy rains between May 5 and 11, 1979 washed the pesticide into Casa Linda Lake. Approximately 300 to 1,000 fish were killed in addition to approximately a dozen ducks. Since the active ingredient in Dasanit™ is short-lived in the environment (approximately three to five weeks), no additional sampling for this compound in sediments or surface water has occurred since the incident. However, the IAS revealed the presence of other constituents at levels above regulatory guidance levels (also known as Applicable or Relevant and Appropriate Requirements [ARARs]) in surface water and sediment at Casa Linda Lake.

The Department of the Navy contracted ARCADIS Geraghty & Miller to prepare the CERCLA Remedial Investigation (RI) Report, the Risk Assessment (RA), and Focused Feasibility Study (FFS) for Casa Linda Lake. This work was performed in response to the listing of the Facility on the NPL. The RI and RA for Casa Linda Lake were submitted in June 1999. The FFS was submitted in November 1999. A Proposed Plan for Casa Linda Lake was submitted in March 2000 and was prepared to fulfill CERCLA section 117(a). The public comment period for the Proposed Plan ended on April 24, 2000.

2.3 Community Participation

The RI/RA report, FFS report and Proposed Plan for the Casa Linda Lake site located at NAS, Jacksonville, Florida were made available to the public in March 2000. They can be found in the Administrative Record file at the Southern Division Headquarters for the U.S. Navy in Charleston, South Carolina, and at the offices of the Navy Contractor, TetraTech/NUS in Jacksonville, Florida. These documents also can be found in the information repository at the Webb Wesconnet Branch of the Jacksonville Public Library. The community was encouraged to review these documents as well as the supporting documentation for this site and provide the USEPA with comments.

The notice of the availability of these documents was published in the Florida Times-Union on March 24, 2000. The public's comment period for this document was 30 days and began on March 24, 2000 and ended on April 24, 2000. No comments were received during the 30-day comment period, and therefore a public meeting was not held.

2.4 Scope and Role of Response Action

As with many Superfund sites, the problems at Jacksonville NAS are complex. Asa result, the U.S. Navy has organized the work into several operable units and PSCs as identified in the IAS. Casa Linda Lake was identified as PSC-21.

Casa Linda Lake is a man-made surface water body used as a storm water retention basin. Casa Linda Lake is functioning as designed by receiving storm water runoff from the central part of NAS and acting as a natural filter to remove contaminants from the collected surface water prior to ultimate discharge to the St. Johns River at Mulberry Cove. While minimal natural habitat has evolved within and around Casa Linda Lake, the intent of the lake was not to provide a sanctuary for wildlife and aquatic species, or human recreational activities such as hunting, fishing, and swimming.

Considering the design and use of Casa Linda Lake, the remedial response actions for the remedy are:

- To eliminate the human exposure pathway (fish consumption) and to ensure protection of the St. Johns River from the COIs identified in the environmental media in the lake, and

- To protect the neighboring wildlife habitat from the COEIs detected in the media within and around this retention basin.

2.5 Summary of Site Characteristics

The conceptual site model (CSM) for the site provides the framework for the risk assessment (Figure 3). It characterizes the primary and secondary potential sources and release mechanisms and identifies the primary exposure points, receptors and exposure routes.

2.5.1 Physical Characteristics of Study Area

Casa Linda Lake is an 11-acre man-made surface water body surrounded by the Casa Linda Oaks Golf Course located at NAS. Elevations range from approximately 25 ft above mean sea level (amsl) southwest of Casa Linda Lake to mean sea level at the banks of the St. Johns River. The potentiometric surface of the surficial aquifer roughly follows the contour of the land.

2.5.1.1 Climate

The climate of the Jacksonville area is humid subtropical. Typically the summers are long, hot and humid and the winters are short and mild, with occasional frost from November through February. The average annual temperature is approximately 70 degrees Fahrenheit ranging from the mid 50s in January to the low 80s in July. The area has an average annual rainfall of approximately 64 inches with half the annual precipitation falling between June and September. Most of the summer rain comes from short duration thunderstorms that occur almost every other day. These showers are often extremely heavy and can cause localized flooding and storm water runoff. Passing hurricanes and tropical storms have their greatest impact through prolonged rains and high tides causing flooding problems that are usually considered equivalent to 100-year storm events.

2.5.1.2 Surface Water Hydrology

NAS is comprised of 66 drainage basins of which only 30 basins contain industrial activities requiring storm water management programs. There are 57 storm water outfalls at NAS which are covered by a National Pollutant Discharge Elimination System (NPDES) multisector permit. The St. Johns River and the Ortega River are primary receiving streams for storm water discharges from the base. The focus of this ROD is Casa Linda Lake which receives storm water from Basin 17 and discharges to the St. Johns River at Outfall C-3.

Casa Linda Lake is a collection basin and discharge basin for storm water and surface water in Basin 17 of NAS's Storm Water Management Plan (Figure 4). Precipitation that falls to the northwest of Casa Linda Lake, from approximately Yorktown and Child Street, and just south of Lake Scotlis and Akron Road drains into Casa Linda Lake. The northwest portion of Basin 17 contains a high density of facility structures, is extensively paved, and storm water is drained by sewer and open drainage ditch systems. Storm water runoff from the portion of Basin 17 south of Casa Linda Lake drains primarily by overland flow due to the lack of drainage ditches or other natural storm water conduits. Additionally, some water enters Casa Linda Lake via infiltration of groundwater from the shallow surficial aquifer. Groundwater infiltration supplies water to the lake during dry seasons when the golf course is using Casa Linda Lake as an irrigation source. Infiltration of groundwater to Casa Linda Lake is also supported by higher groundwater levels in the shallow surficial aquifer surrounding the lake and upward hydraulic gradients from the deep to shallow surficial aquifers.

Surface water discharge from Casa Linda Lake occurs when lake levels exceed the height of the dam/spillway located at the eastern end of the lake. Discharge from Casa Linda Lake enters a small ditch that leads eastward towards Mulberry Cove and the St. Johns River. Prior to streamflow reaching Mulberry Cove, it pools in a small basin (Turtle Pond) which represents the confluence of discharge from Casa Linda Lake and water draining from the southern areas of Basin 17 through a network of open ditches and storm water sewers draining residential facilities at the southeast end of Basin 17.

Water from Turtle Pond drains directly to Mulberry Cove and the St. Johns River via a drainage ditch. Water levels in the drainage ditch from Turtle Pond to Mulberry Cove are affected by tidal fluctuations in the St. Johns River and surface water in this reach is brackish. Tidal fluctuations at NAS average less than 1.5 ft.

2.5.1.3 Storm Water Management Programs at NAS

NAS implemented a SWPPP in 1997 to comply with the requirements of the Clean Water Act (CWA), and Chapter 40 of the Code of Federal Regulations (CFR) 122. The SWPPP is designed to improve the quality of the industrialized storm water runoff generated at NAS thus improving the quality of the receiving waters (i.e. the St. Johns River). The SWPPP incorporates the following components (Ogden, 1997).

1. **Storm Water Monitoring.** Visual inspection of the storm water is conducted on a quarterly basis at each outfall location. The storm water is examined for evidence of sheen, solids and debris. Observations are recorded on inspection logs.

2. **Best Management Practices.** The BMPs were developed in an effort to minimize discharges of pollutants to the storm water system by eliminating the source. Source reduction measures include a variety of practices such as preventative maintenance, chemical substitution, spill prevention, good housekeeping, training, and proper materials management.

3. **Site Compliance Evaluations.** A storm water pollution prevention team (SWPPT) is responsible for conducting site compliance evaluations at NAS. The SWPPT's duties include determining the adequacy of the SWPPP, ensuring that the BMPs are implemented, performing the necessary record keeping and documentation, and performing annual updates and certifications. The SWPPT meets semi-annually to conduct these evaluations and to complete the annual SWPPP update for inclusion of any changes, additional BMPs or other storm water regulations. The SWPPT is also responsible for obtaining the necessary permits for discharge of storm water from construction sites greater than five acres at NAS.

The SWPPT must ensure that the construction activity is conducted in accordance with the appropriate state or local sediment, erosion, and storm water management plans.

The SWPPP also incorporates two existing environmental management plans already implemented at NAS including an Oil Spill Prevention Control and Countermeasures Plan (SPCC) and a Pest Management Plan. These plans, were implemented at the base in September 1995 and June 1993, respectively. A brief description of these programs is provided below (Odgen, 1997).

1. **Oil SPCC Plan.** This plan was prepared for NAS to comply with 40 CFR 112 which makes it illegal to discharge oil to the waters of the state. Site specific SPCC plans were developed for each industrial facility within NAS that has the potential for discharging oil to surface waters. Potential spills identified at NAS include tanker truck raptures or overturn, tank overflows, tank or pipeline failures, leaks, accidents at material storage sites, human error, or other significant discharge events. Each plan incorporates a security and inspection program to prevent discharges associated with tampering or vandalism, and to identify and abate leaks before a significant discharge occurs. The intent of the SPCC plans is to reduce the potential and frequency of spills from entering the storm water drainage system.

2. **Pest Management Plan.** This plan establishes best management practices for use, storage, and disposal of pesticides and herbicides used at various facilities within NAS. One section of the plan is dedicated to pesticide spill prevention and management. A database is maintained to document the pesticides and herbicides used at NAS.

2.5.1.4 Hydrogeoloy

Potentiometric maps of the shallow and deep surficial aquifer generated from water level data collected from direct push well points (DPWPs) installed as part of groundwater assessment activities during the RI are shown on Figures 5 and 6, respectively. The potentiometric surface map of the shallow surficial aquifer shows that groundwater is discharging to Casa Linda Lake from surrounding areas. Groundwater flow in the shallow surficial aquifer is generally to the east.

The potentiometric surface map of the deep surficial aquifer shows groundwater flow is generally toward the east. The discharge pattern evident in the shallow surficial aquifer potentiometric map is not present in the lower surficial aquifer indicating drainage features exhibit the most effect in the shallow surficial aquifer.

In summary, the majority of shallow surficial aquifer groundwater discharge in the vicinity of Casa Linda Lake occurs in the lake. Therefore, introduction of contaminants to the lake would not affect groundwater quality of the surrounding aquifer.

2.5.2 Remedial Investigation Results

The RI for Casa Linda Lake identified several COIs in various media at the lake that are present at concentrations above ARARs and/or To-Be-Considered (TBC) guidelines, or above conservative screening values available from USEPA and the National Oceanic and Atmosphere Administration (NOAA). Table 1 summarizes the COIs identified in each medium, as well as the frequency of detection. As illustrated on Table 1, the most frequent detections of COIs were identified in the sediment in Casa Linda Lake. Figure 7 shows the sampling locations of all samples collected during the RI at Casa Linda Lake. The following sections summarize the COIs as well as discuss general fate and transport evaluations pertaining to the media of concern.

Media which were eliminated from consideration during the RI/RA process include the following:

- Groundwater is not considered a media of interest because the concentrations of constituents did not exceed a screening level or there were limited risks from infrequent detection or there was a lack of probable exposure and/or migration potential.

- Soils are not considered a media of interest because constituent concentrations that were above the screening level were infrequent and there were no potential exposure pathways.

- Surface water did not contain any constituent concentrations that exceeded various surface water screening guidelines; therefore, surface water was eliminated from further discussions of remedial alternatives.

2.5.2.1 Sediments

Casa Linda Lake sediments contained semi-volatile organic concentrations (SVOCs), pesticides, and metals in detectable concentrations. Ten SVOCs (acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene), all of which are subgrouped as polynuclear or polycyclic aromatic hydrocarbons (PAHs), were detected at concentrations above a TBC (Table 1). The frequency of these SVOC exceedances ranged from 2 to 5 occurrences out of 18 samples. Only 14 out of the 18 samples were collected during RI activities in July 1997 and the remaining samples were collected during investigations performed in 1993 on sediments, surface water, and fish (ECT, 1993). Two pesticides (4,4'-DDE and 4,4'-DDD) were detected at concentrations above a TBC at a frequency of 11 occurrences out of 18 samples. Seven metals (arsenic, cadmium, copper, lead, mercury, silver, and zinc) were detected at concentrations above a TBC. The frequency of these metals exceedances ranged from 1 to 8 occurrences out of 18 samples. Sediment analytical results collected during the RI in July 1997 are presented in Table 2, and sediment analytical results collected during the 1993 investigation are presented in Table 3.

Potential routes of migration of constituents in sediments include migration from sediment to surface water, sediment transport, uptake by vegetation, and uptake by fish, and subsequent ingestion of those fish. Several of the constituents detected in sediments exceeded the NOAA Effects-Range Low (ER-Ls) guidance concentrations which are conservative screening levels. These exceedances do not indicate a problem with the sediments, but suggest that each potential route of migration needs to be further evaluated and used in conjunction with the site data to evaluate potential risks to human and ecological receptors.

Sources of PAHs in Casa Linda Lake sediment samples are probably not a result of golf course operations. The highest PAH concentrations were detected near the inflow to Casa Linda Lake where the majority of storm water culverts empty into the lake. Concentrations of PAHs generally decrease from this inflow area to the outfall area at the eastern end of the lake (Figure 8). This distribution pattern. confirms the original hypothesis that COIs (specifically the PAHs) have been introduced into the lake through the storm water system. PAHs also were observed in drainage ditches from Casa Linda Lake to Mulberry Cove and Turtle Pond. The concentration distribution of total PAHs in these ditch samples suggests that while some contribution of PAHs have come from Casa Linda Lake, a significant second source of PAHs in the sediment has come from the drainage system for the southern portions of storm water Basin 17.

The likely sources of pesticides in Casa Linda Lake are from runoff and/or atmospheric deposition at some time in the past since the pesticides that were detected in the sediments are currently banned and not in use at NAS. Unlike the distribution pattern of the PAHs, the highest concentrations of pesticides in Casa Linda Lake are concentrated in the center of the lake (Figure 9). Pesticide concentrations that were above ARARs/TBCs were also observed in drainage ditches from Casa Linda Lake to Mulberry Cove and Turtle Pond. Inorganic constituents were detected above available sediment screening values in Casa Linda Lake. Although inorganic constituents were also detected in the drainage ditches from Casa Linda Lake to Mulberry Cove, the detected concentrations did not exceed available sediment screening values. Figures 10, 11, and 12 show the distribution of inorganic COIs, and suggest that significant sediment transport from Casa Linda Lake is not likely occurring. In addition, surface water data suggest that desorption of PAHs into surface water, if any, occurs at acceptable levels.

Although there are COIs that exceed ARARs/TBCs in the sediment at Casa Linda Lake, a majority of them, specifically PAHs, may be amenable to biodegradation. The presence of robust microbial activity was confirmed during the RI/RA. Due to the age of Casa Linda Lake, it is assumed that the indigenous bacterial populations have acclimated to the site-specific COIs and that the COIs present in sediments are not toxic to the microorganisms. Based on a literature search, it is expected that these bacteria are biodegrading soluble, two and three ring PAHs as a source of carbon and energy. The presence of these bacteria would be instrumental in establishing a basis for a natural recovery remedy for sediments in Casa Linda Lake. The FFS included an evaluation of remedial alternatives for the COIs detected in the lake sediments, including intrinsic biodegradation processes.

2.5.2.2 Plants

A composite sample of submerged aquatic vegetation was collected from Casa Linda Lake during the RI. The plant sample contained SVOCs and various metals in detectable concentrations (Table 4). The SVOCs detected in the plant samples (bis[2-ethylhexyl]phthalate, di-n-butylphthalate, and diethylphthalate), however, differed from those detected in sediment samples and are likely associated with sample containers used in the collection of the composite plant sample. Herbivorous (plant eating) wildlife could potentially be indirectly exposed to constituents in surface water and sediment through ingestion of aquatic plants, if those plants were to take up COEI. The significance of COEI levels detected in aquatic plants and herbivorous wildlife was evaluated in the RA. The FFS included an evaluation of remedial alternatives for protection of the herbivorous wildlife potentially exposed to COEIs through ingestion of aquatic plants.

2.5.2.3 Fish

Casa Linda Lake whole fish samples collected during the RI in 1997 exhibited detectable levels of pesticides, polychlorinated biphenyls (PCBs), metals, and cyanide (Table 5). Fish filet samples also were collected and exhibited detectable levels of DDE and Aroclors. The fish filet sample results were compared to the USEPA risk based concentration (RBC) for fish ingestion since most people eat only the fish and not the organs or bones. Conversely, the whole fish samples were more appropriately used for the ecological analysis. Table 6 summarizes the fish filet analytical results from the RI. One pesticide (4,4'-DDE) and two aroclors (Aroclor 1254 and Aroclor 1260) exceeded the RBC for fish ingestion. The 4,4'-DDE and Aroclor 1260 were detected in all three of the fish samples. Aroclor 1254 was only detected in the two fish samples collected during the 1993 investigation (Table 7). The 4,4'-DDE was detected in the sediment and plant tissues suggesting one or both are likely the source to the fish. There is no apparent on-site source for the Aroclors since they were not detected in any of the other environmental media at Casa Linda Lake. The FFS included an evaluation of remedial alternatives for protection of the fish and fish consumers from the COIs/COEIs in sediment at Casa Linda Lake.

2.6 Current and Potential Future Site and Resource Uses

Currently, Casa Linda Lake is a storm water retention basin that receives storm water from Basin 17 on the Jacksonville NAS. Current land usage immediately surrounding the site includes a golf course, and limited green space, that is used by base personnel and their guests.

It is reasonable to assume that the site will always be a storm water retention basin and that the golf course will be maintained. Development of some of the green space north of the basin may be expected which would increase the storm water runoff into the basin.

Groundwater is not an identified media of concern at the site; therefore, current and anticipated future uses are not relevant to this ROD. The surface water, although not identified as a media of concern, is a potential migration pathway for sediments. The site, acting as a storm water retention basin, is the reason these sediments are concentrated here instead of being transported to the St. Johns River, which is a valuable natural resource and as such, has been designated an American Heritage River.

2.7 Summary of Site Risks

During the RI/FS process, an analysis was conducted to estimate the health or environmental problems that could result if the impacts in Casa Linda Lake were not addressed. This analysis is commonly called a baseline RA. The baseline RA evaluated whether constituent concentrations detected in various media at Casa Linda Lake would pose a significant threat to human health or the environment. Maximum detected constituent concentrations in surface-soil, shallow groundwater, sediment, surface water, and fish samples were screened against USEPA Region 3 RBCs (1997a) in accordance with USEPA Region 4 guidelines to identify COIs for the human health risk assessment. Likewise, maximum constituent concentrations in various media at Casa Linda Lake were screened against USEPA Region 4 (1997b) surface water and sediment screening values and/or No Observed Adverse Effect Levels (NOAELs) to identify COEIs for the screening level ecological risk assessment (SLERA). The findings of the baseline RA relating to the potential human and ecological risks are summarized in the subsections below. Details of the risk evaluation including the exposure assumptions are found in the RI/RA document (ARCADIS Geraghty & Miller, 1999).

2.7.1 Potential Human Health Risks

The following three potential hypothetical exposure scenarios were evaluated in the human health risk assessment. Exposure parameters were based on agency guidance, site-specific information, and professional judgment. Estimates of cancer risk expressed as excess lifetime cancer risk (ELCR), and non-cancer risks, expressed as a hazard index (HI), were calculated for each exposure scenario:

<u>Worker Exposure to Surface Soil During Mowing Activities:</u> Total ELCR = 5 x 10^{-7}; Total HI = 0.002.

<u>Diver Exposure to Sediment and Surface Water:</u> Total ELCR = 7 x 10^{-8}; Total HI = 0.0007.

<u>Fish Ingestion:</u> Total ELCR = 3 x 10^{-5}; Total HI = 2.

With the exception of the fish ingestion exposure scenario, all of the calculated risks are below agency benchmarks for acceptable levels of cancer and non-cancer risk. The acceptable level for cancer risk is generally less than 10^{-6}; however, in some instances acceptable risks can be as high as 10^{-4}. A 10^{-6} risk means that 1 person in 1,000,000 is at risk for developing cancer from exposure to this site. Likewise, a 10^{-4} risk means that

1 person in 10,000 is at risk. The acceptable non-cancer risk is below 1. In the fish ingestion scenario, the calculated cancer risk falls within the benchmark range for acceptable cancer risk; however, the non-cancer risk exceeds the agency benchmark value.

The two constituents that are contributing the most to these risks above benchmark levels are PCBs and arsenic detected in the fish samples. It is unlikely that individuals would ingest the amounts of fish caught from the lake that were used as default values in calculating the risk because there is a catch and release program for Casa Linda Lake. There are many signs posted, warning of potential health hazards from consuming the fish. Additionally, the risk calculations do not take into consideration the reduction in PCB concentrations that has been observed in fish tissue due to cooking. Recent research at Michigan State University (Zabik and March, 1993) coupled with other research on contaminant reduction support at least a 50 percent reduction as a conservative estimate for a reduction factor for PCB concentrations in untrimmed raw filet due to losses through trimming and cooking. The draft USEPA Sampling and Guidance Manual (USEPA, 1993) cites 60 to 90 percent reductions possible through trimming and cooking but does not propose an adjustment value. It is likely that the concentrations of other organic COIs also are reduced by cooking.

In addition, arsenic is a significant contributor to the calculated cancer risk due to fish ingestion. According to information on arsenic toxicity, although some fish and shellfish build up arsenic in their tissues, much of this is in an organic form (often called “Fish arsenic”) that is not toxic (ATSDR, 1996). Based on this information, the risk estimates presented are expected to be significantly overestimated. If the PCB concentrations are reduced by 50 percent and the arsenic concentration is neglected, the total cancer and non-cancer risks are reduced to 1×10^{-5} and 0.8, respectively. If the PCB concentrations are reduced by 90 percent based on cooking loss, these risks are further reduced to 3×10^{-6} and 0.3, respectively (neglecting arsenic). These adjustments indicate that, even if individuals were to ingest the fish under the conservative exposure conditions, the risk levels probably are within or below the acceptable agency benchmark values.

Based on the results of the baseline RA, constituent concentrations in media at Casa Linda Lake are not expected to produce significant risks for the human population.

2.7.2 Potential Ecological Risks

Potential exposure scenarios evaluated in the SLERA included aquatic organisms’ exposure to COEls through direct contact with water and sediment, and wildlife species’ exposure to COEIs through ingestion of or direct contact and ingestion of sediment, surface water, and food items. Three wildlife species, the green heron, raccoon, and painted turtle, were selected as indicator species to represent semi-aquatic fish-eating birds, terrestrial plant and animal-eating mammals, and aquatic plant-eating reptiles, respectively. Although there are potential risks associated with sediment COEIs with respect to the benthic invertebrate community, the lake is a functional storm water retention basin, and these risks are to be expected. The added protection the take affords the receiving waters of the St. Johns River through the retention of storm water provides a higher ecological value than protection of the benthic community within the take.

Potential risks to wildlife receptors were evaluated by comparison of COEI doses in the indicator species' diet with species-specific NOAEL toxicity values. Doses were determined using receptor-specific and site-specific measurements of COEI concentrations in surface water, sediment, whole body fish tissue and plant tissue. Estimates of risk expressed as hazard quotients (HQs) for each potential wildlife receptor are provided below.

Green Heron: HQ = 17

Raccoon: HQ = 36

Painted Turtle: HQ = 2

The COEls contributing most to the risks to the green heron are Aroclor 1254, Aroclor 1260, 4,4'-DDE, selenium, and zinc in fish tissue. The fish tissue data available for this evaluation were derived from fish larger (i.e., greater than 12-inches long) and more mature than those expected to be consumed by fish-eating wildlife at Casa Linda Lake. This overestimates potential risks because the predator species would not be consuming the amount of contaminant that was estimated for the larger fish. Furthermore, the proximity of more favorable habitat in the vicinity of Casa Linda Lake, such as the St. Johns River, reduces the probability that fish-eating birds use Casa Linda Lake as a predominant food source.

The COEIs contributing the most risk to the raccoons are aluminum and arsenic in sediment and thallium in fish tissue. Casa Linda Lake has steep banks, no mudflat area and a lack of adequate coverage, all of that makes this an unfavorable habitat for feeding by animals such as the raccoon. The potential risk is overestimated because there are more accessible food sources nearby.

Lead is the only COEI that presents a potential unacceptable risk to the painted turtle exposed to surface water, sediment, and food items at Casa Linda Lake. The concentration of lead in sediment and aquatic vegetation contributed equally to the HQ. The presence of relatively high levels of inorganics including lead in the submerged aquatic plant sample suggest that those concentrations may be the result of sediment entrained in the sample with the plant tissue.

Based on the results of the baseline RA, there is the potential for unacceptable risks to ecological receptors. However, Casa Linda Lake is a functional storm water retention pond, and these risks are to be expected. The added protection the lake affords the receiving streams of the St. Johns River through the retention of storm water provides a higher ecological value than the protection of the resident wildlife and benthic community within the lake. Moreover, estimated risks to wildlife and aquatic species are likely overestimated due to the use of conservative assumptions in risk calculations and the likelihood that these receptors would use the more favorable habitat available in the area rather than that available at a retention pond in a relatively urbanized setting.

The response action selected in this Record of Decision is necessary to protect public health or welfare and the environment from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

2.8 Remedial Action Objectives

The primary remedial action objectives (RAOs) are to eliminate the human exposure pathway (fish consumption) and to ensure protection of the St. Johns River from the COIs identified in the environmental media in the lake. Since minimal wildlife and aquatic habitat has evolved at Casa Linda Lake, a secondary remedial response objective is to protect the neighboring wildlife habitat from the COEIs detected in the media within and around this retention basin.

Actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present minimal endangerment to the environment.

2.9 Description of Alternatives

The NAS Partnering Team agreed to streamline the Feasibility Study (FS) for Casa Linda Lake by eliminating the detailed remedial alternatives identification and screening process outlined in the USEPA FS guidance. Instead, the FS focused on three specific remedial strategies, as listed below.

- Alternative 1 - No Action

- Alternative 2 - Monitoring with Institutional and Habitat Controls (2 Options)
    - N Passive Habitat Control
    - N Active Habitat Control

- Alternative 3 - Sediment Removal

A brief summary of each of these alternatives is presented below.

2.9.1 Alternative 1 - No Action

Capital Cost:	$0
Annual Operation & Maintenance (O&M) Costs:	$0
Present Worth of O&M (30 years) at 5%:	$0
TOTAL ESTIMATED COST	$0
Months to Implement:	0

The Superfund program requires that the "no action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, no further action would be taken at the site to prevent wildlife exposure to the sediment and food chain contamination. At this site there are existing site controls that limit the human exposure to the fish. These site controls include the posted catch and release program and the fish consumption advisory signs. In the "no action" alternative these signs would not be maintained.

2.9.2 Alternative 2 - Monitoring with Institutional and Habitat Controls

Monitoring with institutional and habitat controls assumes that the lake sediments remain in place but the following components would be implemented to address the risks due to exposure to those sediments:

- Institutional controls comprised of use restrictions and advisory signs which are currently enforced by NAS for Casa Linda Lake;

- Monitoring of Casa Linda Lake in accordance with NAS storm water management programs, including the SWPPP and BMPs; and

- Control of the habitats in the vicinity of Casa Linda Lake via either Option 1 – Passive Habitat Control, or Option 2 - Habitat Eradication, as described below.

Institutional controls will be implemented to reduce the potential human and ecological exposure pathways. The existing use restrictions for Casa Linda Lake will continue to be enforced by NAS. The existing institutional controls include use restriction and advisory signage around the lake, and a catch and release program for all fishing activities at the lake. In addition to these measures, BMPs at NAS, which are designed to prevent point source discharges (from industrial areas at NAS) from entering the storm water management system, will be continued. To ensure these institutional controls for Casa Linda Lake are properly maintained, the controls will be incorporated into the overall Master Plan for NAS. In the event the base is to be redeveloped or expanded such that the storage volume or capacity of Casa Linda Lake needs to be increased, the Master Plan will specify the proper removal, handling, and disposal procedures for the lake sediments. In the event NAS is to be decommissioned or sold for other uses, the institutional controls would be conveyed to the governmental agency that maintains the closed base, or the new property owner, whichever is applicable, as a condition of the property transfer. The reason for such a conveyance would be to restrict future development in the vicinity of Casa Linda Lake until sediment impacts have been sufficiently addressed.

NAS has outlined specific storm water management and monitoring procedures in its SWPPP. This alternative includes monitoring of Casa Linda Lake on a routine basis in accordance with those procedures. The monitoring program will involve visual inspection of the storm water discharging from Casa Linda Lake on a quarterly basis, with observations of sheen, color, odor, solids and debris duly noted on the applicable reporting forms per the SWPPP. These inspections will be conducted at the inlet culverts to Casa Linda Lake, at the lake itself, and at the lake's control structure and the outfall (C-3) at Mulberry Cove. Therefore, the Casa Linda Lake monitoring results will be routinely evaluated, and monitoring procedures will be updated as necessary by the SWPPT to ensure compliance with applicable storm water regulations. Storm water quality summary reports for Casa Linda Lake will be prepared and submitted in accordance with the reporting requirements specified in the SWPPP.

Habitat controls also will be implemented as part of this alternative to reduce human health and ecological risks due to exposure to the COIs/COEIs in lake sediments and the food chain. The two options for habitat control are outlined in the following sections.

2.9.2.1 Passive Habitat Controls

Capital Cost:	$67,500
Annual O&M Costs:	$10,395
Present Worth of O&M (30 years) at 5%:	$159,797
TOTAL ESTIMATED COST	$227,297
Months to Implement:	4

Option 1 entails control of the wildlife and aquatic habitat at Casa Linda Lake through removal of the shoreline vegetation from the lake via mowing, and placement of statues of predatory birds and animals around the lake banks to discourage wildlife from seeking refuge there. Removal of the vegetation along the lake perimeter would create a less attractive environment for wildlife, and reduce the food source for the animals in the vicinity of the lake. Statues of common predatory birds and animals would cause the semi-aquatic fish-eating birds and terrestrial plant and animal-eating mammals in the Casa Linda Lake area to seek other, more favorable habitats. These passive habitat inhibitors will decrease the ecological risk to these species by limiting exposure to the COIs at Casa Linda Lake. Periodic visual inspection of the lake banks will be performed to monitor the effectiveness of the passive habitat controls, and identify the frequency of bank maintenance necessary to minimize vegetation along the perimeter of the lake. To ensure these habitat controls for Casa Linda Lake are properly maintained, the controls will be incorporated into the overall Master Plan for NAS (as discussed above for institutional controls).

2.9.2.2 Active Habitat Controls

Capital Cost:	$97,200
Annual O&M Costs:	$25,650
Present Worth of O&M (30 years) at 5%:	$394,305
TOTAL ESTIMATED COST	$491,505
Months to Implement:	9

Option 2 entails the removal and eradication of the vegetation in and around the perimeter of Casa Linda. Lake, and eradication of aquatic species from the lake. A herbicide would be used to effectively destroy the aquatic vegetation in the lake, and vegetation along the lake banks would be removed via mowing. A fish-killing chemical would be used to eradicate aquatic species in the lake including fish and possibly reptiles. In the event alligators, which are protected species in Florida, are resident at the lake, these protected species will be removed and relocated prior to addition of these chemicals. These measures would reduce or even eliminate potential exposure to COIs via the natural food chain for wildlife that may frequent the lake, including plant-eating mammals, semi-aquatic fish-eating birds, and terrestrial plant and animal-eating mammals. Periodic visual inspection of the lake and banks will be performed to monitor the effectiveness of the habitat eradication controls. The monitoring will also be used to identify the frequency of herbicide and/or fish-killing chemical application to eradicate aquatic species in the lake, and bank maintenance necessary to minimize vegetation along the perimeter of the lake. To ensure these habitat controls for Casa Linda Lake are properly maintained, the controls will be incorporated into the overall Master Plan for NAS (as discussed above for institutional controls).

2.9.3 Alternative 3 --Sediment Removal

Capital Cost:	$9,833,750
Annual O&M Costs:	$0
Present Worth of O&M (30 years) at 5%:	$0
TOTAL ESTIMATED COST	$9,833,750
Months to Implement:	18

Alternative 3 entails the physical removal of one foot of the impacted sediments from the bottom of Casa Linda Lake. The excavated sediment will require on-site treatment and off-site disposal. In the event that impacts are deeper, the removal and disposal costs quoted above, will be substantially greater.

Alternative 3 consists of physical removal of the impacted sediments from the bottom of Casa Linda Lake, on-site treatment to reduce water content, and off-site disposal at an approved, licensed facility. There are a wide variety of removal techniques and disposal/treatment strategies available to achieve the remedial objectives. The technique of dredging using a horizontal auger and disposal of the removed sediment at a permitted off-site disposal facility has been selected as a representative, feasible sediment removal technique for this site.

The COIs detected in the sediment within Casa Linda Lake that are driving the ecological. risk have varying characteristics which make them difficult to treat and/or destroy and the costs are proportionately higher. Therefore, it is more cost effective to remove the sediments and transport them off-site for disposal at a Resource Conservation and Recovery Act (RCRA) permitted Subtitle D landfill. The water from the dredging process would be treated on site and the treated water would be returned to the lake.

2.10 Comparative Analysis of Alternatives

The NCP requires the defined alternatives to be evaluated against the nine established criteria, noting how it compares to the other options under consideration. A glossary of the evaluation criteria is presented below.

2.10.1 Overall Protection

This criterion assesses whether the alternatives adequately protect human health and the environment, including to what degree an alternative would eliminate, reduce or control the risks to human health and the environment, associated with the site, through treatment, engineering, or institutional controls. It is an overall assessment of protection that encompasses other criteria especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Under Alternative 1, Alternative 2 - Option 1, and Alternative 2 - Option 2, the impacted sediments at Casa Linda Lake remain in place, while Alternative 3 involves active remediation of the sediments. Alternative 1 has no active provisions or controls to prevent human or environmental exposure to the lake sediments; thus, human health and the environment would not be protected from the identified potential risks.

Alternative 2 - Options 1 and 2 involve use of institutional controls and habitat (de-enhancement) controls as well as natural recovery processes to minimize the human and ecological risks due to exposure to the impacted sediments. Alternative 2 - Option 2, however, requires eradication of viable aquatic (plant and animal) species, which may offset the benefit of risk reduction.

Alternative 3 involves active remediation of the impacted sediments in Casa Linda Lake thereby providing significant protection of human health and the environment, but due to technology limitations, residual impacts will be left in place or resuspended. Alternative 3 does not include any mechanisms for protecting human health or the environment from the risks due to exposure to the residual impacts. Further, Alternative 3 has potential to impose significant short-term impacts to the ecology (fish, benthic organisms and aquatic plants) during implementation.

Based upon this assessment, Alternative 2 - Option 1 and Alternative 3 appear to offer the best level of protection of human health and the environment. However, public safety risks associated with off-site transportation and disposal of sediments under Alternative 3 make that alternative less acceptable than Alternative 2 - Option 1.

2.10.2 Compliance with ARARs

This criterion determines whether a remedial alternative meets all of its federal and State ARARs. It should be noted that under certain circumstances, it might be appropriate to waive a particular ARAR if it cannot be met by an alternative, as allowed by the NCP under 40 CFR 300.430(f)(ii)(c). All identified chemical-specific, location-specific, and action- specific ARARs should be considered in making this assessment.

Each of the remedial alternatives is capable of complying with some of the identified ARARs, but there are marked differences between alternatives with respect to the duration necessary to achieve chemical-specific ARARs, and the degree of action-specific ARARs. There are no location-specific ARARs associated with any of the remedial alternatives. There are no action-specific ARARs associated with Alternative 1, while Alternative 2 - Options 1 and 2 have moderate safety-related action-specific ARARs, and Alternative 3 has significant safety-related action-specific ARARs. However, these concerns can be properly managed to minimize risk to on-site workers and the general public through implementation of safety programs.

Alternative 1 and Alternative 2 - Options 1 and 2 rely on natural recovery processes to reduce the concentration of COIs in lake sediments to acceptable levels over time. Such natural processes typically require a longer duration than aggressive remedial measures, such as those in Alternative 3, to achieve chemical-specific ARARs. The added benefit of long-term protection from residual risks afforded by the institutional and habitat controls associated with Alternative 2 - Options 1 and 2, render those alternatives slightly more attractive than Alternative 3. While Alternative 3 is capable of complying with chemical-specific ARARs, the limitations associated with dredging activities may result in sediment with COIs to remain above ARARs. Further, COEIs in the food chain (fish and plants), will also remain above ARARs. Therefore, each of the three alternatives evaluated cannot fully comply with all of the chemical- specific ARARs.

2.10.3 Long-Term Effectiveness and Permanence

This criterion assesses whether a remedial alternative would carry a potential, continual risk to human health and the environment after the remedial action would be completed. An evaluation is made as to the magnitude of the residual risk present after the completion of remedial actions as well as the adequacy and reliability of controls that could be implemented to monitor and manage the residual risk remaing.

Alternative 1 lacks measures to restrict or reduce human or environmental exposure to the lake sediments which limits its long-term effectiveness. Alternative 2 - Options 1 and 2 use institutional and habitat controls as well as natural recovery or attenuation processes to provide long-term protection to human health and the environment by minimizing exposure to the impacted sediments at Casa Linda Lake. Incorporation of the institutional and habitat controls into the NAS Master Plan (and SWPPP) and/or base closure or property transfer documentation should provide control of long-term exposure risks, and the monitoring programs associated with these alternatives should provide direct indication of the long-term effectiveness of the control measures.

Alternative 3 significantly reduces the volume of impacted sediment to which humans and the environment could be exposed, but offers no mechanisms for minimizing exposure to residual impacts left in place or resuspended by the removal action.

Alternative 2 - Options 1 and 2 provide the best level of long-term effectiveness. It should be noted, however, that continued use of Casa Linda Lake as a storm water retention basin could limit the long-term effectiveness of all of the alternatives if NAS fails to maintain and update (as necessary) its SWPPP.

2.10.4 Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

This criterion assesses to what degree a remedial alternative, by utilizing treatment technologies, would permanently and significantly reduce the toxicity, mobility or volume of the hazardous substance at the site. This assessment focuses on the magnitude, significance, and irreversibility of remedy or treatment.

The volume of impacted sediments in Casa Linda Lake is not reduced by Alternative 1, Alternative 2 - Option 1, or Alternative 2 - Option 2, while Alternative 3 offers significant reduction in the volume of impacted sediments. The magnitude of impacted sediment volume reduction under Alternative 3 provides a reduction in toxicity as well. The natural recovery processes (e.g., biodegradaton, biotransformation, dispersion, dilution, and burial) will provide natural reduction of the mobility of the lake sediments under the other alternatives, as well as for the residual impacts left in place or resuspended by Alternative 3. The toxicity reduction will be enhanced by the institutional and habitat controls implemented under Alternative 2 - Options 1 and 2.

The mobility of the COIs will be minimal under Alternative 1 or Alternative 2 - Option 1 which are non-intrusive, moderate under Alternative 2 - Option 2 due to herbicide and pesticide application and mixing, and significant under Alternative 3 due to the aggressive removal activities. With respect to COEIs, only Alternative 2 - Option 2 can reduce the toxicity and volume of the food chain (fish and aquatic plants) through eradication of fish and plants. The other alternatives do not include active mechanisms to completely remove these food chain items.

Even though sediment volume and the food chain are not removed, the minimal mobility potential, long-term institutional and habitat controls, and protection of water quality to St. Johns River afforded by Alternative 2 - Option 1 make it more attractive than the other alternatives.

2.10.5 Short-Term Effectiveness

This criterion assesses the degree to which human health and the environment would be impacted during the construction and implementation of the remedial alternative. The protection of workers, the community, and the surrounding environment as well as the time to achieve the remedial response objectives are considered in making this assessment.

Alternative 1 offers no potential for increased or decreased exposure risk since no action is undertaken. Alternative 2 - Option 1 involves far less intrusive actions than the remedial activities associated with Alternative 2 - Option 2 and Alternative 3. The intrusive nature of the habitat eradication under Alternative 2 - Option 2 and the sediment removal action under Alternative 3 poses adverse impacts to daily operations at NAS, safety risks to on-site workers and the general public, and high potential for disturbance or resuspension the COIs in the lake sediments. Thus, the potential risks to human health (i.e., remedial site works and bystanders) and the environment (i.e., benthic and aquatic organisms) may be more significant over the short-term under Alternative 2 - Option 2 and Alternative 3 than Alternative 2 - Option 1.

2.10.6 Implementability

This criterion assesses the technical and administrative feasibility of implementing a remedial alternative and the availability of services and materials required during implementation. The ability to construct and operate the technologies as part of an alternative, the reliability of these technologies, the relative ease of compliance with regulatory requirements, the relative ease of undertaking additional remedial action if required, and monitoring requirements are considered in assessing the technical and administrative feasibility of implementing a remedial alternative.

Alternative 1 is readily implementable. Alternative 2 – Option 1 and Alternative 2 – Option 2 are easily implementable with minimal to moderate scheduling, equipment, and labor, respectively. Implementation of Alternative 3 would require significant planning, contracting, scheduling, and safety considerations, rendering it cumbersome and time consuming.

2.10.7 Cost

This criterion assesses the capital costs, operation and maintenance costs, and total present worth associated with implementing a remedial alternative. The capital costs are divided into direct and indirect costs. Direct capital costs include construction costs, equipment costs, and site development costs. Indirect capital costs include engineering expenses, legal fees and license or permit costs, start-up costs and contingency allowances.

The total estimated present worth cost of the remedial alternatives are listed below, based on the assumptions outlined in the individual, detailed analysis sections above and/or listed on the cost tables:

- Alternative 1 $0
- Alternative 2 - Option 1 $227,297
- Alternative 2 - Option 2 $491,505
- Alternative 3 $9,833,750

2.10.8 State Acceptance

This criterion assesses the technical and administrative issues and concerns the State may have regarding each of the remedial alternatives. Many of these concerns are addressed through compliance with applicable ARARs.

The state of Florida supports the RI/RA, FFS, and Proposed Plan process and the selection of Alternative 2 – Option 1 as the preferred alternative.

2.10.9 Community Acceptance

This criterion assesses the issues and concerns the public may have regarding each of the remedial alternatives. This assessment cannot be fully made until after completing the public comment period in which the community will have an opportunity to respond to the Proposed Plan. Thus, only a speculation can be made on the likelihood of the acceptance or rejection of each remedy by the public.

Community acceptance of Alternative 2 – Option 1 as the preferred alternative is assumed based on the fact that no comments from the public were received during the 30 day public comment period.

2.11 Principal Threat Waste

There are no wastes at the site that constitute principal threats.

2.12 Selected Remedy

The NAS Jacksonville Partnering Team includes representatives from the USEPA, Region 4, the FDEP, and the U.S. Navy. Based on the results of the detailed alternative analyses and the comparative analysis, NAS recommends that <u>Alternative 2 - Option 1, Monitoring with Institutional and Passive Habitat Control</u>, be selected for implementation at Casa Linda Lake.

2.12.1 Summary of Rationale for the Selected Remedy

<u>Alternative 2 - Option 1, Monitoring with Institutional and Passive Habitat Controls</u> provides the necessary monitoring and controls to minimize risks due to exposure to impacted sediments at Casa Linda Lake, achieves the remedial response objectives over time, and provides protection of human health and the environment as cost-effectively as possible. Alternative 2 - Option 1 also provides long-term controls to protect the quality of water discharging into the St. Johns River, which is one of the primary remedial objectives.

Alternative 2, Option 1 would achieve adequate risk reduction for the primary remedial response objectives by eliminating the human exposure to contaminants and contaminant transport to the St. Johns River. In addition, this alternative will also achieve adequate risk reduction for the secondary objectives by protecting ecological receptors through habitat controls. Alternative 2, Option 1 achieves this risk reduction more quickly and at substantially less cost than any of the other remedial options. Alternative 2, Option 1 also is less likely to create negative environmental and human health impacts during implementation than the other remedial options.

Therefore, Alternative 2 - Option 1, Monitoring with Institutional and Passive Habitat Controls is believed to provide the best balance of trade-offs among the alternatives evaluated with respect to the evaluation criteria. Based on the information available at this time, the NAS Jacksonville Partnering Team believes the preferred alternative would be protective of human health and the environment, would comply with ARARs, would be cost effective, and would have long term permanence since the monitoring of the lake would be an integral part of the facility's storm water management program.

2.12.2 Description of the Selected Remedy

The selected remedy, Alternative 2 - Option 1, Monitoring with Institutional and Passive Habitat Controls, assumes lake sediments will remain in place, but the following components will be implemented to address the risks due to exposure to those sediments:

- Institutional controls comprised of use restrictions and advisory signs which are currently enforced by NAS for Casa Linda Lake,
- Monitoring of Casa Linda Lake in accordance with NAS storm water management programs, including the SWPPP and BMPs, and
- Control of the habitats in the vicinity of Casa Linda Lake via Passive Habitat Control, as described below.

Institutional controls will be implemented to reduce the potential human and ecological exposure pathways. The existing use restrictions for Casa Linda Lake will continue to be enforced by NAS. The existing institutional controls include use restriction and advisory signage around the lake, and a catch and release program for all fishing activities at the lake. In addition to these measures, BMPs at NAS, which are designed to prevent point source discharges (from industrial areas at NAS) from entering the storm water management system, will be continued. To ensure these institutional controls for Casa Linda Lake are properly maintained, the controls will be incorporated into the overall Master Plan for NAS. In the event the base is to be redeveloped or expanded such that the storage volume or capacity of Casa Linda Lake needs to be increased, the Master Plan will specify the proper removal, handling, and disposal procedures for the lake sediments. In the event NAS is to be decommissioned or sold for other uses, the institutional controls would be conveyed to the governmental agency that maintains the closed base, or the new property owner, whichever is applicable, as a condition of the property transfer. The reason for such a conveyance would be to restrict future development in the vicinity of Casa Linda Lake until sediment impacts have been sufficiently addressed.

NAS has outlined specific storm water management and monitoring procedures in its SWPPP. The selected remedy includes monitoring of Casa Linda Lake on a routine basis in accordance with those procedures. The monitoring program will involve visual inspection of the storm water discharging from Casa Linda Lake on a quarterly basis, with observations of sheen, color, odor, solids and debris duly noted on the applicable reporting forms per the SWPPP. These inspections will be conducted at the inlet culverts to Casa Linda Lake, at the lake itself, and at the lake's control structure and the outfall (C-3) at Mulberry Cove. NAS' SWPPT evaluates the storm water management and monitoring programs on a semi-annual basis. Therefore, the Casa Linda Lake monitoring results will be routinely evaluated, and monitoring procedures will be updated as necessary by the SWPPT to ensure compliance with applicable storm water regulations. Storm water quality summary reports for Casa Linda Lake will be prepared and submitted in accordance with the reporting requirements specified in the SWPPP.

Passive Habitat Controls also will be implemented as part of this selected remedy to reduce human health and ecological risks due to exposure to the COIs/COEIs in lake sediments and the food chain. Control of the wildlife and aquatic habitat at Casa Linda Lake will be maintained through removal of the herbaceous shoreline vegetation from the lake via mowing, and placement of statues of predatory birds and animals around the lake banks to discourage wildlife from seeking refuge there. Removal of the herbaceous vegetation along the lake perimeter will create a less attractive environment for wildlife, and reduce the food source for the animals (especially herbivores) in the vicinity of the lake. Statues of common predatory birds and animals will cause the semi-aquatic piscivorous birds and terrestrial, omnivorous mammals in the Casa Linda Lake area to seek other, more favorable habitats. These passive habitat inhibitors will decrease the ecological risk to these species by limiting exposure to the COIs at Casa Linda Lake. Periodic visual inspection of the lake banks will be performed to monitor the effectiveness of the passive habitat controls, and identify the frequency of bank maintenance necessary to minimize vegetation along the perimeter of the lake. To ensure these habitat controls for Casa Linda Lake are properly maintained, the controls will be incorporated into the overall Master Plan for NAS (as discussed above for institutional controls).

2.12.3 Summary of the Estimated Remedy Costs

The costs associated with the selected remedy include capital and O&M costs. Capital cost items include consulting services to incorporate the institutional controls, habitat controls, and monitoring programs into the NAS Master Plan (and SWPPP); design, fabrication and installation of signs/statues; mowing/removal of herbaceous vegetation from the banks of Casa Linda Lake, and associated administrative tasks. Since the long term care for management for Casa Linda Lake is being transferred to the storm water management program, implementation of this alternative could occur without complying with the formal Remedial Design/Remedial Action (RD/RA) process under CERCLA. This cost estimate reflects this exclusion. Operations and Maintenance (O&M) cost items include periodic monitoring and lake bank maintenance. The total present worth cost for the selected remedy is estimated to be $227,297 using a discount rate of 5% and assuming implementation of institutional and habitat controls, and monitoring for a 30 year period. The detailed development of this cost estimate is presented in Table 8.

2.12.4 Expected Outcome of the Selected Remedy

The selected remedy, Monitoring with Institutional and Passive Habitat Controls, for implementation at Casa Linda Lake will provide the necessary monitoring and controls to minimize risks due to exposure to impacted sediments at Casa Linda Lake. The selected remedy will achieve the remedial response objectives over time, and provide protection of human health and the environment as cost-effectively as possible. The selected remedy also provides long-term controls to protect the quality of water discharging into the St. Johns River, which is one of the primary remedial objectives.

The following lines of evidence demonstrate that selected remedy for Casa Linda Lake is appropriate.

- The Department of the Navy considers the NAS in Jacksonville, Florida as a critical strategic Base and will maintain operations at the Base for many years to come. This commitment to Base operations provides long-term program stability for the implementation of the selected remedy.

- Institutional controls currently in place at NAS which include a catch and release policy and fish consumption advisories provide the necessary protection to prevent human exposures to the impacted sediment and fish. These controls have been successfully implemented at NAS with no documented violations to date.

- The RA identified potential unacceptable risks to the terrestrial omnivorous mammals, semi-aquatic piscivorous birds, and herbivorous reptiles through food chain exposure pathways. These risks are overestimated based on conservative assumptions that the mammals would come into contact with the lake sediments and that all of these species utilize the lake exclusively as their food source. The habitat control feature of the selected remedy will render those RA assumptions invalid, thereby reducing the calculated risk associated with the food chain exposure pathway.

- The selected remedy requires incorporation of the institutional controls, habitat controls and monitoring programs into the NAS Master Plan (and SWPPP) and/or base closure or property transfer documentation which should provide permanent control of long-term exposure risks. In addition, the monitoring program and SWPPT compliance evaluations associated with this remedy should provide direct indication of the long-term effectiveness of the control measures over time.

- Casa Linda Lake was designed and constructed to operate as a storm water retention basin to protect the St. Johns River from NAS non-point source storm water discharges. The results of the RI/RA show that Casa Linda Lake is functioning as designed by preventing the COIs from migrating to the St. Johns River. The non-intrusive nature of the selected remedy should allow the lake to continue to provide water of acceptable quality to the St. Johns River.

- The selected remedy can be implemented and achieve ARARs/remedial objectives in a cost-effective manner.

- Since the long-term care for management for Casa Linda Lake is being transferred to the storm water management program and institutional controls are already in place at NAS, implementation of this remedy could occur without complying with the formal RD/RA process under CERCLA.

2.13 Statutory Determinations

This section of the ROD discusses how the selected remedy fulfills the statutory requirements of Section 121 of CERCLA with respect to protection of human health and the environment, compliance with ARARs, cost effectiveness, utilization of permanent and alternative treatment solutions, and utilization of treatment for reduction in toxicity, mobility, and volume.

2.13.1 Protection of Human Health and the Environment

The selected remedy satisfies the statutory requirement for protection of human health and the environment through institutional controls, monitoring, and passive habitat controls. The impacted sediments at Casa Linda Lake remain in place under the selected remedy. However, institutional and habitat controls will minimize human and wildlife exposure. Routine monitoring of the lake per the SWPPP, and monitoring of the habitat controls will indicate the effectiveness of these measures in reducing risks due to exposure to the sediment, plants and fish. The natural recovery or attenuation processes will occur as part of this remedy, providing additional protection to human health and the environment over time. In addition, continuation of BMPs at NAS will continue to minimize the potential for impacted sediments to leave Casa Linda Lake and enter the St. Johns River.

2.13.2 Compliance with ARARs

This remedy does not include any active remediation of the lake sediments, and therefore, relies on natural recovery or attenuation processes to reduce risks. While natural recovery processes as part of this remedy may be capable of achieving the chemical-specific ARARs for some organic COIs/COEIs, sediment, aquatic plants and fish tissue may still contain levels exceeding ARARs. Institutional controls and monitoring will be utilized to evaluate the success of natural recovery process over time. A five-year review will be necessary to assess the remedy over time.

Action-specific ARARs will be met due to the fact that site workers at NAS are required to comply with all applicable health and safety regulations, and receive safety training updates on a regular basis.

There are no location-specific ARARs associated with Casa Linda Lake.

2.13.3 Cost Effectiveness

The selected remedy is cost effective as the overall effectiveness of the remedy is proportional to the overall cost of the remedy. The overall effectiveness of the remedy has been determined by evaluating three criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; and short-term effectiveness.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

Although the selected remedy requires the Casa Linda Lake sediments to stay in place, this remedy provides the best balance between the evaluation criteria and offers the best level of protection of human health and the environment. The other options have the potential to impose significant short-term impacts to the ecology (fish, benthic organisms and aquatic plants) during implementation. Public safety risks during implementation of other options associated with off-site transportation and disposal of sediments also make the selected remedy more beneficial than other options.

2.13.5 Reduction in Toxicity, Mobility, or Volume through Treatment

The volume of impacted sediments in Casa Linda Lake is not reduced by the selected remedy. Natural recovery processes (e.g., biodegradation, biotransformation, dispersion, dilution, and burial) will provide natural reduction of the mobility of the lake sediments under the selected remedy. The toxicity reduction will be enhanced by the institutional and habitat controls.

Even though sediment volume and the food chain are not removed, the minimal mobility potential, long-term institutional and habitat controls, and protection of water quality to St. Johns River afforded by the selected remedy make it more attractive and protective than the other alternatives evaluated.

2.13.6 Five-Year Review Requirement

Section 121(c) of CERCLA and the NCP provides the statutory bases for conducting five-year reviews. If there are any hazardous substances, pollutants, or contaminants remaining at the site above levels that would allow for unlimited use and unrestricted exposure, than a review of such remedial action no less often than each five years after the initiation of the remedial action to assure that human health and the environment are being protected by the remedy should be implemented.

The Casa Linda Lake site at NAS will require a five-year review.

2.14 Documentation of Significant Changes

The Proposed Plan for the Casa Linda Lake site was release for public comment on March 24, 2000. The Proposed Plan identified as Alternative 2 - Option 1, Monitoring with Institutional and Passive Habitat Controls, as the preferred alternative. As no comments were received either written or verbally during the public comment period, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

3. Responsiveness Summary

There were no comments received from the community at large during the 30-day comment period for this site's Proposed Plan. The NAS Parterning Team have agreed that the transfer of the management of this site to the NPDES program is the most appropriate action. The pollutants/contaminants identified during various assessments including the recent RI are typical of long-term functioning storm water retention basins which are generally not candidates for CERCLA-type response actions.

4. References

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TABLES

Tables

TABLE 1
SUMMARY OF COIs AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

Analytes	GROUNDWATER[1/] ARARs/TBCs Federal MCL[a/]	Florida GWG[b/]	FREQUENCY OF ARAR/TBC EXCEEDANCE	SOIL[1/] ARARs/TBCs EPA RBC RES[c/]	EPA SSL GW[d/]	FL SCG RES[e/]	FL SCG Lch.[f/]	FREQUENCY OF ARAR/TBC EXCEEDANCE	SURFACE WATER[1/] ARARs/TBCs FL Class III Freshwater[g/]	FREQUENCY OF ARAR/TBC EXCEEDANCE	SEDIMENT[2/] ARARs/TBCs NOAA ER-L[h/]	FREQUENCY OF ARAR/TBC EXCEEDANCE	FISH[2/,3/] ARARs/TBCs EPA RBC FSH[j/]	FREQUENCY OF ARAR/TBC EXCEEDANCE
TCL Semivolatiles														
Phenol	NS	10	1 of 8	47,000,000	49,000	34,000,000	20		4,600,000		NS		810,000	
Naphthalene	MS	6.8	1 of 8	3,100,000	30,000	1,300,000	100		NS		160		NS	
Acenaphthene	NS	10		4,700,000	200,000	2,800,000	2,000		2,700		44	5 of 18	81,000	
Acenaphthylene	NS	10		NS	NS	670,000	11,000		0.31[j/]		16	2 of 18	NS	
Fluorene	NS	280		3,100,000	160,000	2,400,000	45,000		370		19	3 of 18	NS	
Phenanthrene	NS	20		NS	NS	1,700,000	2,800		0.31[j/]		240	2 of 18	NS	
Anthracene	NS	2,100		880	700	20,000,000	89,000		110,000		85.3	2 of 18	41,000	
Fluoranthene	NS	280		NS	NS	2,900,000	280,000		370		600	2 of 18	54,000	
Pyrene	NS	210		NS	NS	2,200,000	290,000		11,000		665	4 of 18	41,000	
Benzo(a)anthracene	NS	4		880	7,000	1,400	29,000		0.31[j/]		261	4 of 18	4.3	
bis(2-Ethylhexyl)phthalate	6	NS		46000	11000	48	11		NS		NS		230	
Chrysene	NS	5		88,000	1,000	140,000	31,000		0.31[j/]		384	4 of 18	430	
Benzo(a)pyrene	0.2	0.2		8.8	4000	100	3700		0.31[j/]		430	4 of 18	0.43	
TCL Pesticides/PCBs														
Dieldrin	NS	0.1		4	1	70	20		0.0019		NS		0.2	
4,4'-DDE	NS	0.1		1,900	500	3,000	200		NS		2.2	11 of 18	9.3	3 of 5
Endrin aldehyde	NS	0.1	1 of 8	NS	NS	23,000	50		NS		NS		NS	
4,4'-DDD	NS	0.1		2,700	700	4,500	200		NS		1.58	11 of 18	13	
4,4'-DDT	NS	0.1		1,900	1,000	3,100	500		0.001		NS		9.3	
Aroclor 1254	NS	0.5		1,600	NS	NS	NS		0.014		NS		27	2 of 5
Aroclor 1260	NS	0.5		319	NS	NS	NS		0.014		NS		1.6	3 of 5
TAL Metals														
Aluminum	NS	200	8 of 8	78,000	NS	75,000	NS		1,500[k/]		NS		1,400,000	
Arsenic	50	50		0.43	15	0.7	NS	2 of 6	50		8.2	6 of 18	4,100	
Beryllium	2	2		0.15	180	0.2	NS	1 of 6	130		NS		0.73	
Cadmium	5	5		39	6	37	NS		1,190		1.2	5 of 18	NS	
Copper	1,300	1,000		3,100	NS	NS	NS		12,530[k/]		34	8 of 18	5,400	
Iron	NS	300	8 of 8	23,000	NS	NS	NS		1,000		NS		410,000	
Lead	15	15		NS	NS	500	NS		3,460[k/]		46.7	8 of 18	NS	
Manganese	NS	50	8 of 8	1,800	NS	370	NS		NS		NS		3,100	
Silver	100	100		390,000	NS	390,000	NS		0.05		1	1 of 18	6,800	
Zinc	5,000	5,000		23,000	42,000	23,000	NS		111,980[k/]		150	6 of 18	410,000	
Mercury	2	2		23	23	23	NS		0.012		0.15	7 of 18	410	

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TABLE 1
SUMMARY OF COIs AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

Footnotes:

	Concentrations are listed in parts per billion
1/ -	All samples collected during 1997 RI (AG&M, 1999)
2/ -	Includes samples collected during 1997 RI (AG&M, 1999) and 1993 Electroshocking Fisheries Investigation (ECT, 1993)
3/ -	Fish Filet samples only
ARAR -	Applicable or Relevant and Appropriate Requirements
TBC -	To-Be-Considered Standards
a/ -	Federal Primary and Secondary Drinking Water Standards
b/ -	Florida Groundwater Guidance Standards, Chapters 62-520,420 and 62-520.420 FAC
c/ -	USEPA Risk Based Residential Soil Ingestion Concentrations (USEPA Region III March 17,1997)
d/ -	USEPA Risk Based Soil Screening Levels Transfers from Soil to Groundwater (USEPA Region III March 17, 1997)
e/ -	Florida Residential Soil Cleanup Goals (FDEP September 29,1995)
f/ -	Florida Leaching Soil Cleanup Goals (FDEP September 29, 1995)
g/ -	National Oceanic and Atmospheric Administration Effects Range Low
h/ -	Florida Class III Fresh Water Standards, Chapter 62-30.5.530 FAC
i/ -	USEPA Risk Based Fish Ingestion Concentrations (USEPA Region III, March 17, 1997)
j/ -	Annual average for total of acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo-(a,h)anthracene, indeno(1,2,3-od)pyrene, and phenanthrene.
k/ -	Calculated using average hardness of all samples = 107mg/L, Class III Fresh Water, Chapter 62-305.530
NS -	No Standard Available
(shaded box)	ARAR for specific media exceeded
	Bold indicates ARAR exceeded if multiple ARARs available

TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-01	CLL-SD-02	CLL-SD-03	CLL-SD-93[1/]	CLL-SD-04	CLL-SD-05
					SL LOG NUMBER	S774129A*1	S774129A*2	S774129A*3	S774129A*4	S774163A*3	S774163A*1
					SAMPLE DATE	07/23/97	07/23/97	07/23/97	07/23/97	07/24/97	07/24/97
					MATRIX	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
					% Solids	62	70	15	14	14	12
		ARARs									
	NAS	FLSQAGS		NOAA	NOAA						
	BSC	TEL	PEL	ER-L	ER-M						
TCL Semimolatiles(8270), ug/kg dw											
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NS	NS	NS	NS	< 530	< 470	< 2200	< 2400	< 2400	< 2800
Naphthalene	NA	34.6	391	160	2100	< 530	< 470	< 2200	< 2400	< 2400	< 2800
Acenaphthylene	NA	5.87	128	44	640	< 530	< 470	< 60 J	< 2400	< 2400	< 2800
Acenaphthene	NA	6.71	88.9	16	500	31 J	< 470	< 2200	< 2400	< 2400	< 2800
Fluorene	NA	21.2	144	19	540	67 J	< 470	< 2200	< 2400	< 2400	< 2800
Phenanthrene	NA	86.7	544	240	1500	1200	< 470	< 110 J	110 J	< 2400	< 2800
Anthracene	NA	46.9	245	85.3	1100	190	< 470	64 J	34 J	< 2400	< 2800
Fluoranthene	NA	113	1,494	600	5100	3400 J	< 470	480 J	360 J	260 J	300 J
Pyrene	NA	153	1,398	665	2600	3400	< 470	560 J	500 J	330 J	390 J
Butylbenzylphthalate	NA	NS	NS	NS	NS	460 J	< 470	< 2200 J	< 2400 J	< 2400	< 2800
Benzo(a)anthracene	NA	74.8	693	261	1600	1200	< 470	< 2200	< 2400	120 J	< 2800
Bis(2-Ethylhexyl)phthalate	NA	182	2,647	NS	NS	810 J	< 470	540 J	450 J	< 2400	590 J
Chrysene	NA	108	846	384	2800	1600 J	< 470	300 J	250 J	180 J	220 J
Benzo(b)fluoranthene	NA	NS	NS	NS	NS	1900 J	< 470	310 J	260 J	210 J	< 2800
Benzo(k)fluoranthene	NA	NS	NS	NS	NS	1900 J	< 470	320 J	270 J	200 J	< 2800
Benzo(a)pyrene	NA	88.8	763	430	1600	1500 J	< 470	< 190 J	180 J	140 J	160 J
Benzo(1,2,3-cd)pyrene	NA	NS	NS	NS	NS	970 J	< 470	< 2200	< 2400	< 2400	< 2800
Benzo(g,h,i)perylene	NA	NS	NS	NS	NS	960 J	< 470	140 J	< 2400	< 2400	< 2800
Carbazole	NA	NS	NS	NS	NS	310 J	< 470	< 2200	< 2400	< 2400	< 2800
TCL Pesticides/PCBs (8080), ug/kg dw											
delta-BHC	NA	NS	NS	NS	NS	4.2 R	< 2.4	< 11	7.0	16 R	< 14
Aldrin	NA	NS	NS	NS	NS	4.0 R	< 2.4	< 11	< 61	< 61	< 14
Heptachlor epoxide	NA	NS	NS	NS	NS	< 27	< 2.4	< 57	< 61	< 61	6.0 R
Endosulfan I	NA	NS	NS	NS	NS	< 27	< 2.4	< 11	12 NJ	8.9 R	< 14
Dieldrin	NA	0.715	4.3	NS	NS	8.7 J	< 4.7	< 110	46 R	44 R	6.4 R
4,4'-DDE	NA	2.07	3.74	2.2	27	11 J	< 4.7	410 D	410 D	520 D	100 D
Endrin	NA	NS	NS	NS	NS	< 53	< 4.7	< 22	< 120	< 120	< 28
Endrin aldehyde	NA	NS	NS	NS	NS	< 53	< 4.7	< 110	23 R	24 R	11 R
Endosulfan II	NA	NS	NS	NS	NS	< 53	< 4.7	< 22 J	< 120	93 R	10 R

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-01	CLL-SD-02	CLL-SD-03	CLL-SD-93 [1/]	CLL-SD-04	CLL-SD-05
					SL LOG NUMBER	S774129A*1	S774129A*2	S774129A*3	S774129A*4	S774163A*3	S774163A*1
					SAMPLE DATE	07/23/97	07/23/97	07/23/97	07/23/97	07/24/97	07/24/97
					MATRIX	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
					% Solids	62	70	15	14	14	12
	ARARs										
	NAS BSC	FLSQAGS TEL	FLSQAGS PEL	NOAA ER-L	NOAA ER-M						
4,4'-DDD	NA	1.22	7.81	1.58	46.1	6 J	< 4.7	< 180 J	140	59 JD	9.1 J
Endosulfan sulfate	NA	NS	NS	NS	NS	< 53	< 4.7	< 22	< 120	< 120	< 28
4,4'-DDT	NA	1.19	4.77	NS	NS	< 53	< 4.7	< 22	< 120	< 120	< 28
Endrin Ketone	NA	NS	NS	NS	NS	< 53	< 4.7	12 J	15 J	17 J	7.6 J
Methoxychlor	NA	NS	NS	NS	NS	< 270	< 24	14 NJ	< 610	< 610	6.2 R
alpha-Chlordane	NA	NS	NS	NS	NS	21 J	< 2.4	< 57	< 61	< 61	< 14
gamma-Chlordane	NA	NS	NS	NS	NS	32	< 2.4	17 NJ	< 61	< 61	5.4 NJ
TAL Metals, mg/kg dw											
Aluminum (6010)	1,190	NS	NS	NS	NS	833 J	2860 J	10100 J	7840 J	1050 J	6290 J
Arsenic (6010)	1.26	7.24	41.6	8.2	70	1.7	1.4	193	169	208	37.7
Beryllium (6010)	0.48	NS	NS	NS	NS	0.14 J	0.26 J	1.1 J	0.97 J	0.98 J	0.91 J
Cadmium (6010)	0.6	0.676	4.21	1.2	9.6	< 0.81	0.72	3.7	3 J	1.9 J	2.6 J
Calcium (6010)	6,468	NS	NS	NS	NS	7020	648	4970	4470	8990	6120
Chromium (6010)	3.8	52.3	160	81	370	5.8	5.6	39.7	34.5	35.1	28.7
Cobalt (6010)	3.8	NS	NS	NS	NS	0.49 J	0.23 J	4.3 J	3.6 J	3.2 J	3.2 J
Copper (6010)	7	18.7	108	34	270	12.6 J	< 3.6	260 J	246 J	234 J	185 J
Iron (6010)	2,300	NS	NS	NS	NS	5160	1120	34900	3490	6330	39500
Lead (6010)	14.4	30.2	112	46.7	218	66 J	5.2 J	481 J	415 J	360 J	300 J
Magnesium (6010)	131	NS	NS	NS	NS	286 J	251 J	1110 J	988 J	713 J	562 J
Maganese (6010)	6.8	NS	NS	NS	NS	26.9 J	4.7	40.4	35.8	35.8	41.3
Nickel (6010)	6.2	15.9	42.8	20.9	51.6	< 6.5	< 5.7	< 26.7	< 28.6	< 28.6	< 33.3
Potassium (6010)	218	NS	NS	NS	NS	67.8 J	81.1 J	688	594 J	534 J	285 J
Silver (6010)	NA	0.733	1.77	1.0	3.7	< 1.6	< 1.4	< 6.6	< 6.9	< 7.2	< 8.2
Vanadium (6010)	5.2	NS	NS	NS	NS	6.2	8.3	52.2	44.2	48.4	38.9
Zinc (6010)	18.4	124	271	150	410	64.5 J	< 2.9	771 J	688 J	635 J	413 J
Mercury (7470/7471)	0.1	0.13	0.696	0.15	0.71	0.044	< 0.014	1.1 J	1.3	1.1	0.55

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]	ARARs					SAMPLE ID	CLL-SD-01			CLL-SD-02			CLL-SD-03			CLL-SD-93 [1/]			CLL-SD-04			CLL-SD-05	
						SL LOG NUMBER	S774129A*1			S774129A*2			S774129A*3			S774129A*4			S774163A*3			S774163A*1	
						SAMPLE DATE	07/23/97			07/23/97			07/23/97			07/23/97			07/24/97			07/24/97	
						MATRIX	SEDIMENT			SEDIMENT			SEDIMENT			SEDIMENT			SEDIMENT			SEDIMENT	
						% Solids	62			70			15			14			14			12	
	NAS BSC	FLSQAGS TEL	FLSQAGS PEL	NOAA ER-L	NOAA ER-M																		
Acid Volatile Sulfide, mg/kg dw							57		<	36			310			240		<	180		<	210	
AVS Extractable Cadmium (6010)	NS	NS	NS	NS	NS		0.27		<	0.10			3.8			4			3.4			2.5	
AVS Extractable Copper (6010)	NS	NS	NS	NS	NS		7.7	J	<	0.52	J		112	J		93.7	J		78.6	J		108	J
AVS Extractable Nickel (6010)	NS	NS	NS	NS	NS		0.60	J	<	0.83			2.8	J		2.6	J		2.1	J		2.6	J
AVS Extractable Zinc (6010)	NS	NS	NS	NS	NS		78.2		<	0.54			559			554			523			329	
AVS Extractable Lead (6010)	NS	NS	NS	NS	NS		35.9	J		1.6	J		367	J		373	J		321	J		235	J
SEMI/AVS Cadmium	NS	NS	NS	NS	NS		0.00			0.00			0.01			0.02			0.04			0.01	
SEMI/AVS Copper	NS	NS	NS	NS	NS		0.14			0.01			0.36			0.39			0.87			0.51	
SEMI/AVS Nickel	NS	NS	NS	NS	NS		0.01			0.02			0.01			0.041			0.02			0.01	
SEMI/AVS Zinc	NS	NS	NS	NS	NS		1.37			0.02			1.80			2.31			5.81			1.57	
SEMI/AVS Lead	NS	NS	NS	NS	NS		0.63			0.09			1.18			1.55			3.57			1.12	
Total Organic Carbon (9060), mg/kg dw				NS	NS		7300			1100			60000			110000			130000			130000	
pH (9045), std units				NS	NS		6.86			6.26			6.5			6.48			7.13			6.4	
Oxidation Reduction Potential, mV				NS	NS		130			220			96			150			170			160	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-06		CLL-SD-07		CLL-SD-08		CLL-SD-09		CLL-SD-10	
					SL LOG NUMBER	S774163A*4		S774187*1		S774163A*2		S774187*2		S774187*3	
					SAMPLE DATE	07/24/97		07/25/97		07/24/97		07/25/97		07/25/97	
					MATRIX	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
					% Solids	13		12		16		74		78	
	ARARs														
	NAS BSC	FLSQAGS TEL	FLSQAGS PEL	NOAA ER-L	NOAA ER-M										
TCL Semimolatiles(8270), ug/kg dw															
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NS	NS	NS	NS	< 2500		< 2800		< 2100	J	< 440		< 420	
Naphthalene	NA	34.6	391	160	2100	< 2500		< 2800		< 2100	J	440		< 420	
Acenaphthylene	NA	5.87	128	44	640	< 2500		< 2800		< 2100	J	180	J	< 420	
Acenaphthene	NA	6.71	88.9	16	500	< 2500		< 2800		< 2100	J	8.5	J	< 420	
Fluorene	NA	21.2	144	19	540	< 2500		< 2800		< 2100	J	24	J	< 420	
Phenanthrene	NA	86.7	544	240	1500	< 2500		< 2800		< 2100	J	190	J	< 420	
Anthracene	NA	46.9	245	85.3	1100	< 2500		< 2800		< 2100	J	79	J	< 420	
Fluoranthene	NA	113	1,494	600	5100	420	J	170	J	170	J	460		< 420	
Pyrene	NA	153	1,398	665	2600	480	J	200	J	250	J	680		< 420	
Butylbenzylphthalate	NA	NS	NS		NS	2500		< 2800		< 2100	J	440		< 420	
Benzo(a)anthracene	NA	74.8	693	261	1600	190	J	< 2800		< 2100	J	440	J	< 420	
Bis(2-Ethylhexyl)phthalate	NA	182	2,647	NS	NS	< 2500		< 2800		< 2100	J	440		< 420	
Chrysene	NA	108	846	384	2800	260	J	140	J	< 2100	J	460		< 420	
Benzo(b)fluoranthene	NA	NS	NS	NS	NS	240	J	< 2800		< 2100	J	630		< 420	
Benzo(k)fluoranthene	NA	NS	NS	NS	NS	250	J	< 2800		< 2100	J	690		< 420	
Benzo(a)pyrene	NA	88.8	763	430	1600	180	J	< 2800		< 2100	J	680		< 420	
Benzo(1,2,3-cd)pyrene	NA	NS	NS	NS	NS	< 2500		< 2800		< 2100	J	400	J	< 420	
Benzo(g,j,i)perylene	NA	NS	NS	NS	NS	< 2500		< 2800		< 2100	J	460		< 420	
Carbazole	NA	NS	NS	NS	NS	< 2500		< 2800		< 2100	J	57	J	< 420	
TCL Pesticides/PCBs (8080), ug/kg dw															
delta-BHC	NA	NS	NS	NS	NS	< 13		< 14		19	NJ	5.4	R	3.3	R
Aldrin	NA	NS	NS	NS	NS	< 13		< 14		< 11		< 4.6		< 2.2	
Heptachlor epoxide	NA	NS	NS	NS	NS	< 13		< 14		< 11		< 4.6		< 2.2	
Endosulfan I	NA	NS	NS	NS	NS	19	J	< 14		< 11		< 4.6		< 2.2	
Dieldrin	NA	0.715	4.3	NS	NS	< 25		< 28		21		< 8.9		< 4.2	
4,4'-DDE	NA	2.07	3.74	2.2	27	260	D	60		75		6	J	1.4	J
Endrin	NA	NS	NS	NS	NS	< 25		< 28		< 21		< 8.9		< 4.2	
Endrin aldehyde	NA	NS	NS	NS	NS	13	R	4.7	R	5.3	R	< 8.9		< 4.2	
Endosulfan II	NA	NS	NS	NS	NS	8.5	R	2.1	R	< 21		< 8.9		< 4.2	

TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-06		CLL-SD-07		CLL-SD-08		CLL-SD-049		CLL-SD-10	
					SL LOG NUMBER	S774163A*4		S774187*1		S774163A*2		S774187*2		S774187*3	
					SAMPLE DATE	07/24/97		07/25/97		07/24/97		07/25/97		07/25/97	
					MATRIX	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
					% Solids	13		12		16		74		78	
	ARARs														
	NAS	FLSQAGS		NOAA	NOAA										
	BSC	TEL	PEL	ER-L	ER-M										
4,4'-DDD	NA	1.22	7.81	1.58	46.1	44		< 3.9	J	4.6	J	2.8	J	0.88	J
Endosulfan sulfate	NA	NS	NS	NS	NS	< 25		< 28		< 21		< 8.9		< 4.2	
4,4'-DDT	NA	1.19	4.77	NS	NS	38		19	J	< 21		1.2	R	0.71	J
Endrin Ketone	NA	NS	NS	NS	NS	8.4	J	3.2	NJ	< 21		1.5	R	< 4.2	
Methoxychlor	NA	NS	NS	NS	NS	< 130		< 140		< 110		5.9	NJ	< 22	
alpha-Chlordane	NA	NS	NS	NS	NS	3.8	R	1.3	R	< 11		0.38	R	1.1	R
gamma-Chlordane	NA	NS	NS	NS	NS	12	J	6.4	J	< 11		0.36	R	1.4	J
TAL Metals, mg/kg dw															
Aluminum (6010)	1,190	NS	NS	NS	NS	5960	J	5660	J	4370	N	4990	J	214	J
Arsenic (6010)	1.26	7.24	41.6	8.2	70	113		30.1		42		3.9		< 1.3	
Beryllium (6010)	0.48	NS	NS	NS	NS	0.68	J	0.73	J	0.60	J	0.95		< 0.64	
Cadmium (6010)	0.6	0.676	4.21	1.2	9.6	1.3	J	0.82	J	0.39	J	0.40	J	< 0.64	
Calcium (6010)	6,468	NS	NS	NS	NS	4600		4900		5340		35800		393	
Chromium (6010)	3.8	52.3	160	81	370	35		23.3		19.7		7		8.4	
Cobalt (6010)	3.8	NS	NS	NS	NS	2.2	J	2.7		2.4	J	1.2	J	< 1.3	
Copper (6010)	7	18.7	108	34	270	150	J	161	J	224	J	15.3	J	< 3.2	
Iron (6010)	2,300	NS	NS	NS	NS	29400		32400		35200		4840		286	
Lead (6010)	14.4	30.2	112	46.7	218	260	J	203	J	214	J	28.9	J	29.4	J
Magnesium (6010)	131	NS	NS	NS	NS	580	J	598	J	619	J	2250	J	47.2	
Maganese (6010)	6.8	NS	NS	NS	NS	36.3		42.4		73.5		166		2.7	
Nickel (6010)	6.2	15.9	42.8	20.9	51.6	< 30.8		< 33.3		< 25		3.5	J	< 5.2	
Potassium (6010)	218	NS	NS	NS	NS	278	J	317	J	278	J	922		18.4	J
Silver (6010)	NA	0.733	1.77	1.0	3.7	< 7.6		< 8.1		< 6.1		< 1.3		< 1.3	
Vanadium (6010)	5.2	NS	NS	NS	NS	37.4		30.8		28.4		4.7		0.53	J
Zinc (6010)	18.4	124	271	150	410	388	J	310	J	278	J	< 28		< 4.0	
Mercury (7470/7471)	0.1	0.13	0.696	0.15	0.71	0.41		0.36		0.35		< 0.013		< 0.013	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-06		CLL-SD-07		CLL-SD-08		CLL-SD-09		CLL-SD-10	
					SL LOG NUMBER	S774163A*4		S774187*1		S774163A*2		S774187*2		S774187*3	
					SAMPLE DATE	07/24/97		07/25/97		07/24/97		07/25/97		07/25/97	
					MATRIX	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
					% Solids	13		12		16		74		78	
	ARARs														
	NAS BSC	FLSQAGS TEL	FLSQAGS PEL	NOAA ER-L	NOAA ER-M										
Acid Volatile Sulfide, mug/kg dw						< 190		210		160		< 34		< 32	
AVS Extractable Cadmium (6010)	NS	NS	NS	NS	NS	2.7		2.4		1.5		0.2		< 0.093	
AVS Extractable Copper (6010)	NS	NS	NS	NS	NS	103	J	107	J	84.0	J	2.1	J	0.80	J
AVS Extractable Nickel (6010)	NS	NS	NS	NS	NS	2.9	J	1.7	J	1.9	J	0.36	J	< 0.74	
AVS Extractable Zinc (6010)	NS	NS	NS	NS	NS	357		285		208		18		2.7	
AVS Extractable Lead (6010)	NS	NS	NS	NS	NS	246	J	190	J	164	J	6.4	J	1.6	J
SEMI/AVS Cadmium	NS	NS	NS	NS	NS	0.03		0.02		0.02		0.01		0.00	
SEMI/AVS Copper	NS	NS	NS	NS	NS	1.08		1.02		1.05		0.12		0.05	
SEMI/AVS Nickel	NS	NS	NS	NS	NS	0.03		0.02		0.02		0.02		0.02	
SEMI/AVS Zinc	NS	NS	NS	NS	NS	3.76		2.71		2.60		1.06		0.17	
SEMI/AVS Lead	NS	NS	NS	NS	NS	2.59		1.81		2.05		0.38		0.10	
Total Organic Carbon (9060), mg/kg dw	NS	NS	NS	NS	NS	100000		120000		88000		2000		1100	
pH (9045), std units				NS	NS	6.63		6.61		6.66		7.54		7.14	
Oxidation Reduction Potential, mV				NS	NS	170		190		170		98		210	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), Units [a/]					**SAMPLE ID**	CLL-SD-11		CLL-SD-12		CLL-SD-13	
					SL LOG NUMBER	S774187A*4		S774187A*5		S774187A*6	
					SAMPLE DATE	07/25/97		07/25/97		07/25/97	
					MATRIX	SEDIMENT		SEDIMENT		SEDIMENT	
					% Solids	65		64			
	ARARs										
	NAS BSC	FLSQAGS TEL	FLSQAGS PEL	NOAA ER-L	NOAA ER-M						
TCL Semimolatiles(8270), ug/kg dw											
3-Methylphenol/4-Methylphenol(m&p-cresol)	NA	NS	NS	NS	NS	< 510		< 520		< 690	
Naphthalene	NA	34.6	391	160	2100	< 510		20	J	< 690	
Acenaphthylene	NA	5.87	128	44	640	< 510		< 520		< 690	
Acenaphthene	NA	6.71	88.9	16	500	< 510		22	J	17	J
Fluorene	NA	21.2	144	19	540	< 510		520		< 690	
Phenanthrene	NA	86.7	544	240	1500	28	J	98	J	110	J
Anthracene	NA	46.9	245	85.3	1100	5.3	J	25	J	32	J
Fluoranthene	NA	113	1,494	600	5100	79	J	600		380	J
Pyrene	NA	153	1,398	665	2600	110	J	880		570	J
Butylbenzylphthalate	NA	NS	NS	NS	NS	< 510		< 520		< 690	
Benzo(a)anthracene	NA	74.8	693	261	1600	51	J	660		260	J
Bis(2-Ethylhexyl)phthalate	NA	182	2,647	NS	NS	< 510		< 520		< 690	J
Chrysene	NA	108	846	384	2800	49	J	650		280	J
Benzo(b)fluoranthene	NA	NS	NS	NS	NS	< 510		510	J	260	J
Benzo(k)fluoranthene	NA	NS	NS	NS	NS	48	J	680		270	J
Benzo(a)pyrene	NA	88.8	763	430	1600	45		560		240	J
Indeno(1,2,3-cd)pyrene	NA	NS	NS	NS	NS	< 510		230	J	110	J
Benzo(g,j,i)perylene	NA	NS	NS	NS	NS	< 510		210	J	< 690	
Carbazole	NA	NS	NS	NS	NS	< 510		< 520		< 690	
TCL Pesticides/PCBs (8080), ug/kg dw											
delta-BHC	NA	NS	NS	NS	NS	< 2.6		0.33	R	2.3	R
Aldrin	NA	NS	NS	NS	NS	< 2.6		0.24	J	< 7.1	
Heptachlor epoxide	NA	NS	NS	NS	NS	< 2.6		< 2.6		< 7.1	
Endosulfan I	NA	NS	NS	NS	NS	< 2.6		0.72	R	< 7.1	
Dieldrin	NA	0.715	4.3	NS	NS	< 5.1		< 5.2		3.1	J
4,4'-DDE	NA	2.07	3.74	2.2	27	< 2.5	J	2	NJ	27	
Endrin	NA	NS	NS	NS	NS	0.35	J	0.22	R	0.6	R
Endrin aldehyde	NA	NS	NS	NS	NS	< 5.1		0.72	J	< 14	
Endosulfan II	NA	NS	NS	NS	NS	< 5.1		< 5.2		< 14	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

					Sample ID		CLL-SD-11			CLL-SD-12			CLL-SD-13	
					SL LOG NUMBER		S774187*4			S774187*5			S774187*6	
ANALYTES (Method), units [a/]					**SAMPLE DATE**		07/25/97			07/25/97			07/25/97	
					MATRIX		SEDIMENT			SEDIMENT			SEDIMENT	
					% Solids		65			64			48	
	ARARs													
	NAS	FLSQAGS		NOAA	NOAA									
	BSC	TEL	PEL	ER-L	ER-M									
4,4'-DDD	NA	1.22	7.81	1.58	46.1		2.9	J		3. 9	NJ		13	R
Endosulfan sulfate	NA	NS	NS	NS	NS	<	5.1			0.96	J		2.1	J
4,4'-DDT	NA	1.19	4.77	NS	NS	<	5.1			1.4	J		2.2	R
Endrin ketone	NA	NS	NS	NS	NS	<	5.1		<	5.2			3.0	R
Methoxychlor	NA	NS	NS	NS	NS		0.86	NJ		13	R	<	71	
alpha-Chlordane	NA	NS	NS	NS	NS		0.42	NJ		0.71	NJ	<	7.1	
gamma-Chlordane	NA	NS	NS	NS	NS		0.40	R		1.4	J		1.7	NJ
TAL Metals, mg/kg dw														
Aluminum (6010)	1,190	NS	NS	NS	NS		222	J		3820	J		871	J
Arsenic (6010)	1.26	7.24	41.6	8.2	70	<	1.5		<	1.6			1.5	J
Beryllium (6010)	0.48	NS	NS	NS	NS	<	0.77			0.20	J		0.094	J
Cadmium (6010)	0.6	0.676	4.21	1.2	9.6	<	0.77		<	0.78		<	1.0	
Calcium (6010)	6,468	NS	NS	NS	NS		572			2510			1190	
Chromium (6010)	3.8	52.3	160	81	370		0.85	J		6.4			5.1	
Cobalt (6010)	3.8	NS	NS	NS	NS	<	1.5			0.28	J		0.30	J
Copper (6010)	7	18.7	108	34	270	<	3.8		<	3.9			8.6	
Iron (6010)	2,300	NS	NS	NS	NS		575			3120			2830	
Lead (6010)	14.4	30.2	112	46.7	218		5.7	J		7.2	J		18.8	J
Magnesium (6010)	131	NS	NS	NS	NS		33.4	J		551	J		380	J
Manganese (6010)	6.8	NS	NS	NS	NS		3.8			8.7			10.4	
Nickel (6010)	6.2	15.9	42.8	20.9	51.6	<	6.1		<	6.3		<	8.3	
Potassium (6010)	218	NS	NS	NS	NS		20.3	J		169			97.1	J
Silver (6010)	NA	0.733	1.77	1.0	3.7	<	1.5		<	1.6		<	2.1	
Vanadium (6010)	5.2	NS	NS	NS	NS		0.65	J		10.1			3.7	
Zinc (6010)	18.4	124	271	150	410	<	5.5		<	3.1		<	30.0	
Mercury (7470/7471)	0.1	0.13	0.696	0.15	0.71	<	0.015			0.045			0.048	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTES (Method), units [a/]						Sample ID SL LOG NUMBER SAMPLE DATE MATRIX % Solids	CLL-SD-11 S774187*4 07/25/97 SEDIMENT 65		CLL-SD-12 S774187*5 07/25/97 SEDIMENT 64		CLL-SD-13 S774187*6 07/25/97 SEDIMENT 48	
		ARARs										
	NAS	FLSOAGS		NOAA	NOAA							
	BSC	TEL	PEL	ER-L	ER-M							
Acid Volatile Sulfide, mg/kg dw							39		< 39		< 52	
AVS Extractable Cadmium (6010)	NS	NS	NS	NS	NS		< 0.11		< 0.11		0.26	
AVS Extractable Copper (6010)	NS	NS	NS	NS	NS		1.9	J	< 0.57	J	2.4	J
AVS Extractable Nickel (6010)	NS	NS	NS	NS	NS		< 0.89		< 0.90		0.34	J
AVS Extractable Zinc (6010)	NS	NS	NS	NS	NS		5		0.74		22.8	
AVS Extractable Lead (6010)	NS	NS	NS	NS	NS		5.2	J	0.84	J	15.3	J
SEM/AVS Cadmium	NS	NS	NS	NS	NS		0.00		0.00		0.01	
SEM/AVS Copper	NS	NS	NS	NS	NS		0.05		0.01		0.09	
SEM/AVS Nickel	NS	NS	NS	NS	NS		0.00		0.02		0.01	
SEM/AVS Zinc	NS	NS	NS	NS	NS		0.13		0.04		0.88	
SEM/AVS Lead	NS	NS	NS	NS	NS		0.13		0.04		0.59	
Total Organic Carbon (9060), mg/kg dw				NS	NS		3100		3700		27000	
pH (9045), std units				NS	NS		6.81		7.67		7.02	
Oxidation Reduction Potential, mV				NS	NS		160		12		150	

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TABLE 2
SUMMARY OF SEDIMENT ANALYTICAL RESULTS COLLECTED JULY 23-26, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

Footnotes:

ARAR	Applicable or Relevant and Appropriate Requirements
ug/kg dw	micrograms per kilogram dry weight
mg/kg dw	milligram per kilogram dry weight
J	Compound concentration is qualified as estimated. Refer to Data Validation Memoranda in Appendix H, Final RI/RA (AG&M, 1999) for details
R	Unusable/rejected compound data. Refer to Data Validation Memoranda in Appendix H, Final RI/RA (AG & M, 1999) for details.
D	Compound concentration was quantitated using a secondary dilution
Z	Compound data not used. Refer to Data Validation Memoranda in Appendix H, Final RI/RA (AG & M, 1999) for details.
a/	Analytes not listed were not detected in any sample above their respective instrument detection limit.
FLSQAGS	Florida Sediment Quality Assessment Guidelines, Table 4, November 1994
NAS BSC	NAS Background Screening Concentrations for Sediments, Table 4-5, RI/FS, Operable Unit 1, March 1996
NJ	Presumptive evidence of TCL pesticide/PCB compound. Compound concentration is qualified as estimated. Refer to Data Validation Memoranda in Appendix H Final RI/ (AG&K 1999) for details.
1/	Field duplicate sample of CLL-SD-03
2/	Field duplicate sample of SL-SD-03
<	Analyte was not detected below indicated laboratory reporting limit
TAL	Target Analyte List
TCL	Target Compound List
NS	No Standard Available
mV	millivolts
ER-L	Effects Range-Low
ER-M	Effects Range-Median
NOAA	National Oceanic and Atmospheric Administration
	Exceeds NOAA ER-L
	Detection Limit Exceeds NOAA ER-L

TABLE 3
SUMMARY OF SEDIMENT QUALITY RESULTS FOR FEBRUARY 3, 1993
IN CASA LINDA LAKE, NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

PARAMETER/ANALYTE (units)	SEDIMENT ARARS	SAMPLE ID SAMPLE DATE	JAXCL-SD01 2/3/93			JAXCL-SD02 2/3/93			JASCL-SD03 2/3/93	
VOCs (ug/kg)	NA		BDL			BDL			BDL	
SVOCs (ug/kg)										
Anthracene	85 (A)	<	3,300			63	J	<	3,000	
Benzo(a)anthracene	230 (A)	<	3,300			680		<	3,000	
Benzo(a)pyrene	400 (A)	<	3,300			790		<	3,000	
Benzo(b)fluoranthene	NS		400	J		1,300			320	J
Benzo(g,h,i)perylene	NS	<	3,300			270	J	<	3,000	
Benzo(k) fluoranthene	NS		380	J		1,200		<	3,000	
Bis(2-ethylhexyl)phthalate	NS		1,200	J		660	J		590	J
Butylbenzylphthalate	NS	<	3,300			66	J	<	3,000	
Chrysene	400 (A)	<	3,300			1,300			590	J
Fluoranthene	600 (A); 18,800 (B)		440	J		1,900			420	J
Indeno(1,2,3-cd)pyrene	NS	<	3,300			650		<	3,000	
Phenanthrene	225 (A); 1.29 (B)	<	3,300			500	J	<	3,000	
Pyrene	350 (A); 13,100 (B)		430	J		1,500		<	3.000	
Pesticides and PCBs (μg/kg)										
Aroclor-1254	50 (A); 195 (B)		410	J	<	520			230	J
Carbazole	NS	<	3,300			170	J	<	3,000	
4,4'-DDD	2 (A)	<	66			18	JP	<	60	
4,4'-DDE	2 (A)		74			9.5	J		51	J
alpha-Chlordane	NS	<	34			33		<	31	
gamma-Chlordane	NS	<	34			30	P	<	31	
Inorganic Compounds (mg/kg)										
Aluminum	NS		15,800			1,100			12,000	
Arsenic	NS		91.1			3.6	B		50.8	
Barium	NS		104	B		17.8	B		93	B
Beryllium	NS		2.2	B	<	0.21			1.1	B
Cadmium	5 (A)		8.3	B	<	1.0		<	5.4	
Calcium	NS		7,390			3,080			7,460	B
Chromium	80 (A)		43.4			3.3	B		33.4	
Cobalt	NS		6.9	B		0.99		<	5.1	
Copper	70 (A)		262			6.8	B		236	
Iron	NS		55,200			6,140			43,700	

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TABLE 3
SUMMARY OF SEDIMENT QUALITY RESULTS FOR FEBRUARY 3, 1993
IN CASA LINDA LAKE, NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

PARAMETER/ ANALYTE (units)	SEDIMENT ARARS	SAMPLE ID SAMPLE DATE		JAXCL-SD01 2/3/93			JAXCL-SD02 2/3/93		JASCL-SD03 2/3/93	
Lead	35 (A)			492			691		261	
Magnesium	NS			1,530	B		354	B	1,220	B
Manganese	NS			55.6			27.2		77.2	
Mercury	0.15 (A)			0.16	B	<	0.01		0.12	B
Nickel	30 (A)		<	20.2		<	3.5		19.0	B
Sodium	NS			2,350	B	<	361		1,980	B
Vanadium	NS			59.2	B		5.0	B	40.9	B
Zinc	170 (A)			637			51.1		377	

FOOTNOTES

Source: *Final Report on An Electroshocking Fisheries Investigation in Three Water Bodies on Naval Air Station, Jacksonville, Florida* (March, 1993)
ARARs - Applicable or Relevant and Appropriate Requirements
BDL - Below applicable detection limits for all analytes in this group.
NS - No Standard exists
VOCs - Volatile Organic Compounds
SVOCs - Semi-Volatile Organic Compounds
ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
B - Reported concentration is less than contract required detection limit, but greater than or equal to the instrument detection limit.
P - Concentration confirmation was greater than 25% difference between gas chromatograph columns.
J - Estimated concentration
(A) National Oceanic and Atmospheric Administration Sediment Effects-Range Low Guideline
(B) USEPA Sediment Quality Criteria

TABLE 4
SUMMARY OF PLANT TISSUE ANALYTICAL RESULTS
COLLECTED AUGUST 12, 1997 IN CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTE (Method) Units a/			
SAMPLE ID		CLL-FL-01/-91	
TLI LOG NUMBER		179-37-2,3	
SAMPLE DATE		8/12/97	
MATRIX		PLANT	
TCL Semivolatiles (8270), ug/kg			
Benzoic acid	<	22173	J
Hexachlorobutadine	<	19489	J
Diethylphthalate		9236.38	J
Di-n-butylphthalate		57897	J
bis(2-Ethylhexyl)phthalate		214117	J
TCL Pesticides/PCBs (8080), ug/kg dw			
4,4'-DDE	<	326	J
Dieldrin	<	326	J
TAL Metals (6010), mg/kg			
Aluminum		242	J
Antimony		2.36	J
Arsenic		8.33	J
Barium		116	J
Cadmium		15.2	J
Calcium		12100	
Chromium		1.88	J
Cobalt		0.695	
Copper		144	J
Iron		10200	J
Lead		47.6	J
Magnesium		5480	
Manganese		510	
Nickel		4.17	J
Potassium		39800	J
Selenium		4.35	
Silver		2.04	J
Sodium		9530	
Vanadium		1.77	
Zinc	<	374	J
Mercury (7471)		0.114	J

a/ Analytes not listed were not detected above their respective instrument detection limit.
ug/kg - Micrograms per kilogram.
mg/kg - Milligrams per kilogram.
J -Compound concentration is qualified as estimated. Refer to Data Validation Memoranda in Appendix 1, Final RI/RA AG&M, 1999) for details

TABLE 5

SUMMARY OF WHOLE FISH TISSUE ANALYTICAL RESULTS COLLECTED JULY 26-28,1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTE (Method) Units	SAMPLE ID TL / LOG NO. / SAMPLE DATE / MATRIX	CLL-FS-01	CLL-FS-02	CLL-FS-03/04
	LOG NO.	177-43-1	177-43-3	177-43-6,7
	SAMPLE DATE	7/28/97	7/28/97	7/28/97
	MATRIX	WHOLE FISH	WHOLE FISH	WHOLE FISH
	EPA RBC FSH			
TCL Pesticides/PCBs (8080), ug/kg				
alpha-BHC	NS	< 1.67	< 1.66	1.91
Aldrin	0.19	< 10.75	< 1.66	7.01
4,4'-DDE	9.3	285.6 D	305.7 D	300.3
gamma-Chlordane	NS	< 1.67	< 1.66	< 1.66
Heptachlor	0.70	< 1.67	< 1.66	< 1.66
Heptachlor epoxide	0.35	< 1.67	< 1.66	< 1.66
Aroclor 1260	1.6	584.5 D	573.93 D	467.15
TAL Metals (6010), mg/kg				
Antimony	0.054	< 0.780	< 0.781	< 0.766
Arsenic	0.0021	0.953	0.853	< 0.766
Barium	95	0.439	< 0.391	0.675
Calcium	NS	8300 J	8540 J	24600
Chromium	6.8 [1/]	1.06	0.591	0.743
Copper	54	1.04	< 0.977	0.98
Iron	410	21.6	19.2	< 7.66
Lead	NS	< 0.390	< 0.391	< 0.383
Magnesium	NS	341 J	360 J	757
Manganese	31	< 0.390	0.563	1.21
Nickel	27	0.845	< 0.586	< 0.575
Potassium	NS	2490 J	2190 J	2910
Selenium	6.8	1.06	1.11	2.55
Sodium	NS	1390	1040	1500
Thallium	NS	< 0.975	1.19	0.991

Footnotes on Page 2

TABLE 5

SUMMARY OF WHOLE FISH TISSUE ANALYTICAL RESULTS COLLECTED JULY 26-28, 1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE J
Jacksonville, Florida

ANALYTE (Method)	**SAMPLE ID**	CLL-FS-01	CLL-FS-02	CLL-FS-03/04
Units	**TL LOG NO.**	177-43-1	177-43-3	177-43-6,7
	SAMPLE DATE	7/28/97	7/28/97	7/28/97
	MATRIX	WHOLE FISH	WHOLE FISH	WHOLE FISH
	EPA RBC FSH			
Zinc	410	18.1	19.5	27.7
Mercury (7471)	0.41	< 0.089	< 0.071	< 0.071

Footnotes

EPA RBC FSH - USEPA Risk-based Fish Ingestion Concentrations (USEPA Region III, March 17, 1997)
ug/kg - Micrograms per kilogram.
mg/kg - Milligrams per kilogram.
J - Compound concentrations is qualified as estimated. Refer to Data Validation Memoranda in Appendix I, Final RI/RA (AG&M, 1999) for details.
D - Compound concentration was quantitated using a secondary dilution.
NS - No standard
[1/] As Chromium VI
Exceeds EPA RBC for fish ingestion.
Detection limit exceeds EPA RBC for fish ingestion

TABLE 6

SUMMARY OF FISH FILET ANALYTICAL RESULTS COLLECTED JULY 28,1997 AT CASA LINDA LAKE
NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

ANALYTE (Method) Units		CLL-FS-05		CLL-FS-02/06		CLL-FS-03/04/07	
	SAMPLE ID	CLL-FS-05		CLL-FS-02/06		CLL-FS-03/04/07	
	TL LOG NUMBER	177-43-2		177-43-4,5		177-43-810	
	SAMPLE DATE	7/28/97		7/28/97		7/28/97	
	MATRIX	FISH FILET		FISH FILET		FISH FILET	
	EPA RBC FSH						
TCL Pesticides/PCBs (8080), ug/kg							
4,4'-DDE	9.3	43.89	D	28.52	D	22.14	D
4,4'-DDT	9.3	< 3.33		< 3.32		< 3.33	
gamma-Chlordane	NS	< 1.67		< 1.66		< 1.66	
Aroclor 1254	27	< 33.32		< 33.22		< 33.27	
Aroclor 1260	1.6	248.13	D	108.04	D	90.75	D
TAL Metals (6010), mg/kg							
Aluminum	1,400	< 19.5		42.8		< 19.2	
Barium	95	0.833		< 0.388		< 0.385	
Calcium	NS	20000	**J**	1760	**J**	7420	**J**
Lead	NS	< 0.389		< 0.388		< 0.385	
Magnesium	NS	650	**J**	282	**J**	402	**J**
Manganese	31	< 0.389		< 0.388		0.407	
Potassium	NS	3070	**J**	3240	**J**	3260	**J**
Selenium	6.8	2.36		< 0.969		1.24	
Sodium	NS	905	**J**	555	**J**	660	**J**
Zinc	410	25.4		< 8.05		14.1	
Mercury (7471)	0.41	0.142		< 0.081		< 0.083	
Cyanide, Total (9012), mg/kg	NS	1.5	**J**	< 0.5	**J**	< 0.5	**J**

FOOTNOTES

EPA RBC FSH - USEPA Risk-based Fish Ingestion Concentrations (USEPA Region III, March 17, 1997)

J - Compound concentration is qualified as estimated. Refer to Data Validation Memoranda in Appendix I, Final RI/RA (AG&M, 1999) for det

D - Compound concentration was quantitated using a secondary dilution.

[a/] - Analytes not listed were not detected above their respective instrument detection limit.

Exceeds EPA RBC For fish ingestion.

Detection limit exceeds EPA RBC for fish ingestion.

NS - No standard

ug/kg - micrograms per kilogram

mg/kg - milligrams per kilogram

TABLE 7

SUMMARY OF ANALYTICAL RESULTS FOR BIOTA SAMPLES COLLECTED IN FEBRUARY 1993 FROM CASA LINDA LAKE, NAVAL AIR STATION JACKSONVILLE

Jacksonville, Florida

PARAMETER/ ANALYTE (units)	JAXCL-B001 Fillet		JAXCL-B002 Fillet		JAXCL-B003 Fillet		JAXCL-B004 Fillet		JAXCL-B00501 Fillet		JAXCL-B00601 Fillet		JAXCL-B00701 Fillet	
SVOCs (ug/L)														
Bis(2-ethylhexyl) phthalate	2000	U	2000	U	2000	U	2000	U	4000	U	4000	U	4000	U
Di-n-butylphthalate	2000	U	2000	U	2000	U	2000	U	4000	U	4000	U	4000	U
4-Methylphenol	2000	U	2000	U	14000		2000	U	4000	U	4000	U	4000	U
Pesticides and Polychlorinated Biphenyls (PCBs) (ug/L)														
a-Chlordane	5.1	U	5.1	U	5.1	U	5.1	U	6.7	P	13	P	3	JP
4,4'-DDD	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U	12	P	9.9	U
4,4'-DDE	39		13		10		15		77		120		34	
Aroclor-1254	130	U	46	J	43	J	53	JP	260		390		120	
Inorganic Compounds (ug/L)														
Aluminum	0.97	U	0.97	U	0.97	U	1.2	B	0.97	U	1.4	B	1.1	B
Arsenic	0.03	U	0.03	U	0.03	B	0.03	U	0.03	B	0.03	U	0.05	B
Barium	0.07	B	0.11	B	0.43	B	0.72	B	0.91	B	0.93	B	1.2	B
Calcium	1090		2650		3820		6280		4110		4240		4470	
Chromium	0.17	B	0.15	B	0.18	B	0.33	B	0.19	B	0.21	B	0.21	B
Cobalt	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
Copper	0.88	B	0.33	B	0.43	B	0.53	B	1		1		1.4	U
Cyanide	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U
Iron	3.6	B	4.6		8.4		18.2		56.1		30.6		31.3	
Lead	0.07	U	0.1	B	0.08	B	0.15		0.23		0.27		0.16	
Magnesium	305		319		349		387		325		296		302	
Manganese	0.16	B	0.2	B	0.97		1.5		1.6		2.2		2	
Selenium	0.07	U	0.16	B	0.14	B	0.07	U	0.07	U	0.07	U	0.22	
Sodium	550		637		752		876		1050		979		830	
Vanadium	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
Zinc	8		9.7		12.7		13.4		12.6		13.6		17.7	

FOOTNOTES

Source: *Final Report on An Electroshocking Fisheries Investigation in Three Water Bodies on Naval Air Station, Jacksonville, Florida* (March, 1993)

SVOCs - Semi-Volatile Organic Compounds

ug/L - micrograms per liter

A = Compound not identified above detection limits, detection limit is listed.

J = Estimated concentration.

U = Compound not identified above detection limit, detection limit is listed.

P = Indicates a pesticide analyte with a greater than 25 percent difference for detected concentrations between GC columns.

B = Reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).

D = Diluted sample.

DDD = dichlorophenol dichloroethane.

DDE = dichlorophenyl dichloroethane.

TABLE 8
DETAILED COST ANALYSIS ALTERNATIVE 2 - OPTION 1: MONITORING WITH INSTITUTIONAL AND PASSIVE HABITAT CONTROLS
CASA LINDA LAKE, NAVAL AIR STATION JACKSONVILLE
Jacksonville, Florida

CAPITAL COSTS

CAPITAL COSTS	Quantity	Unit	Cost per Unit	Total
Advisory Signs	50	Each	$100	$5,000
Predatory Statues	50	Each	$200	$10,000
Lake Bank Improvements	1	LS	$5,000	$5,000
Institutional Controls Documentation (SWPPP, BMPs)	1	LS	$15,000	$15,000
Habitat Engineering & Design	1	LS	$10,000	$10,000
Health & Safety	1	LS	$5,000	$5,000
SUBTOTAL CAPITAL COSTS				*$50,000*
Management Oversight	20%			$10,000
Contingency	15%			$7,500
TOTAL CAPITAL COST				$67,500

OPERATIONS AND MAINTENANCE COSTS

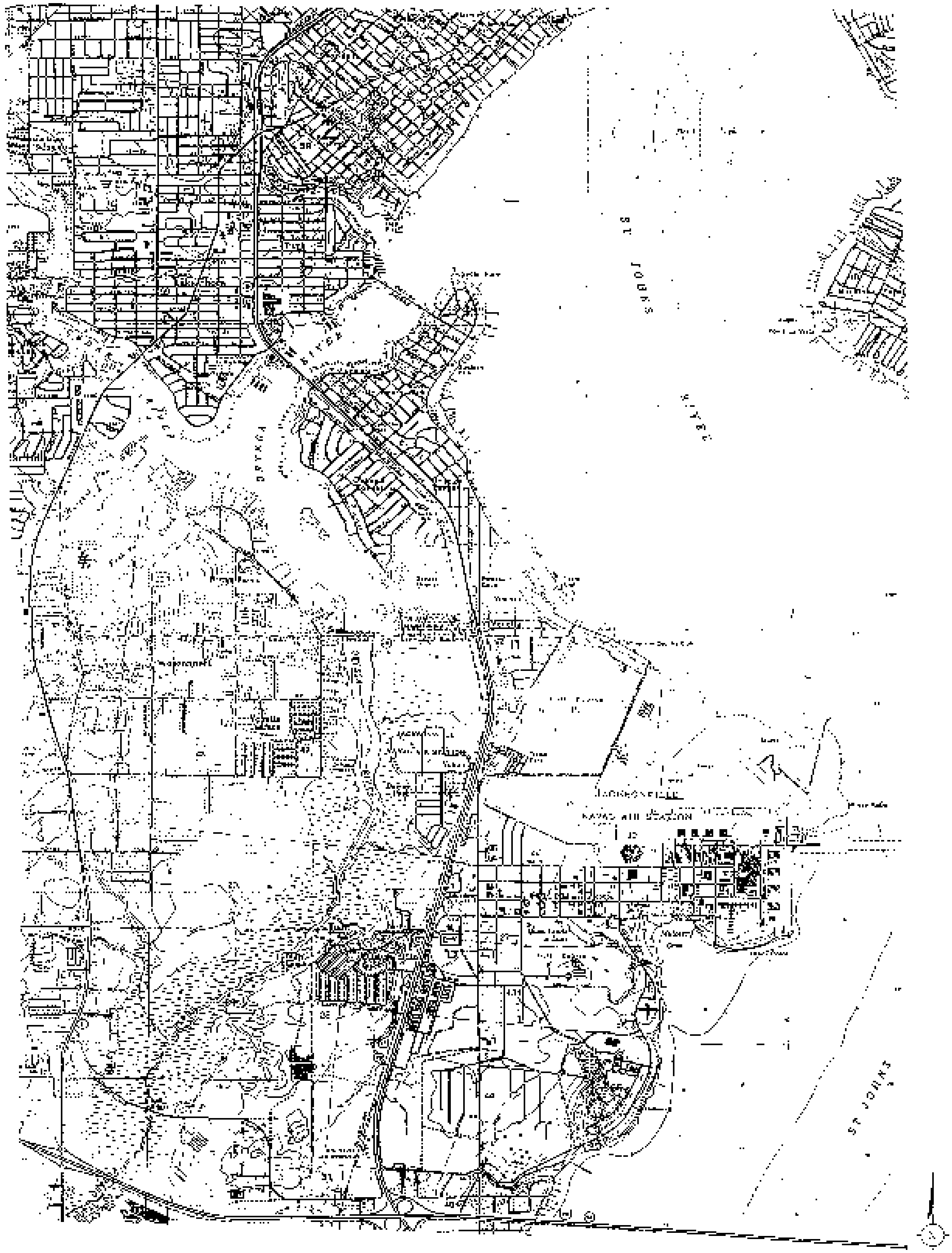
ANNUAL O&M COST	Quantity	Unit	Cost per Unit	Total
Mowing of Banks (2/month)	24	Each	$50	$1,200
Signs & Statue Replacement	1	LS	$1,500	$1,500
Monitoring (Annual)	1	LS	$5,000	$5,000
SUBTOTAL O&M COSTs				*$7,700*
Project Management	20%			$1,540
Contingency	15%			$1,155
TOTAL ANNUAL O& M COST				***$10,395***
PRESENT WORTH OF O & M (30 YEARS) at 5%				$159,797

TOTAL ESTIMATED COST: ALTERNATIVE 2 - OPTION 1 $227,297

AX7298/R0D/tb1/ALT2-0P1_C0ST, 8/18/00

Figures

FIGURES



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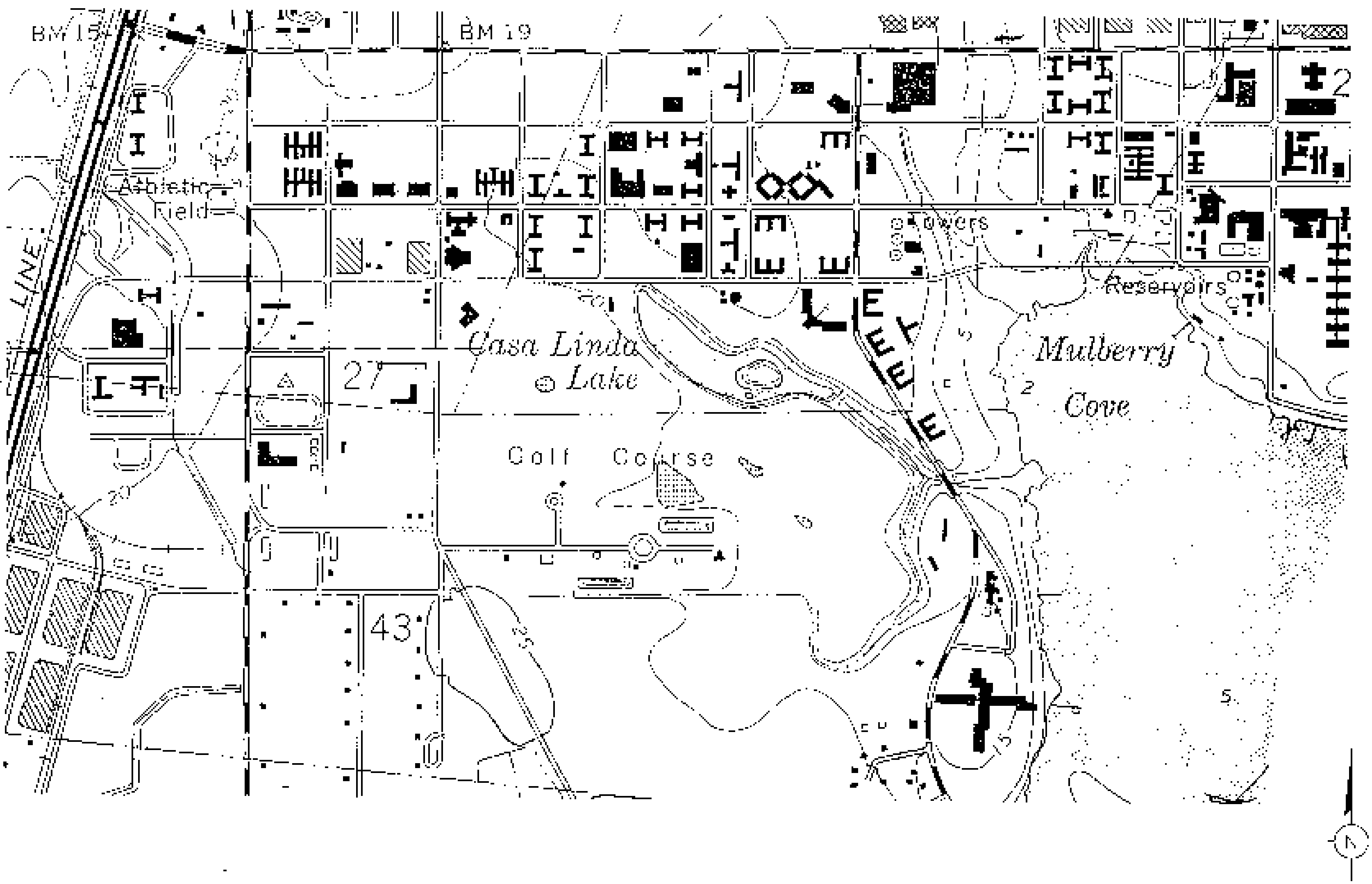
LOCATION OF NAVAL AIR STATION JACKSONVILLE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

1



SCALE 1"=1000'

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DATE
DRAWN
APPROVED
CHECKED
CADD FILE NAME
PROJECT NUMBER

CASA LINDA LAKE SITE MAP

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

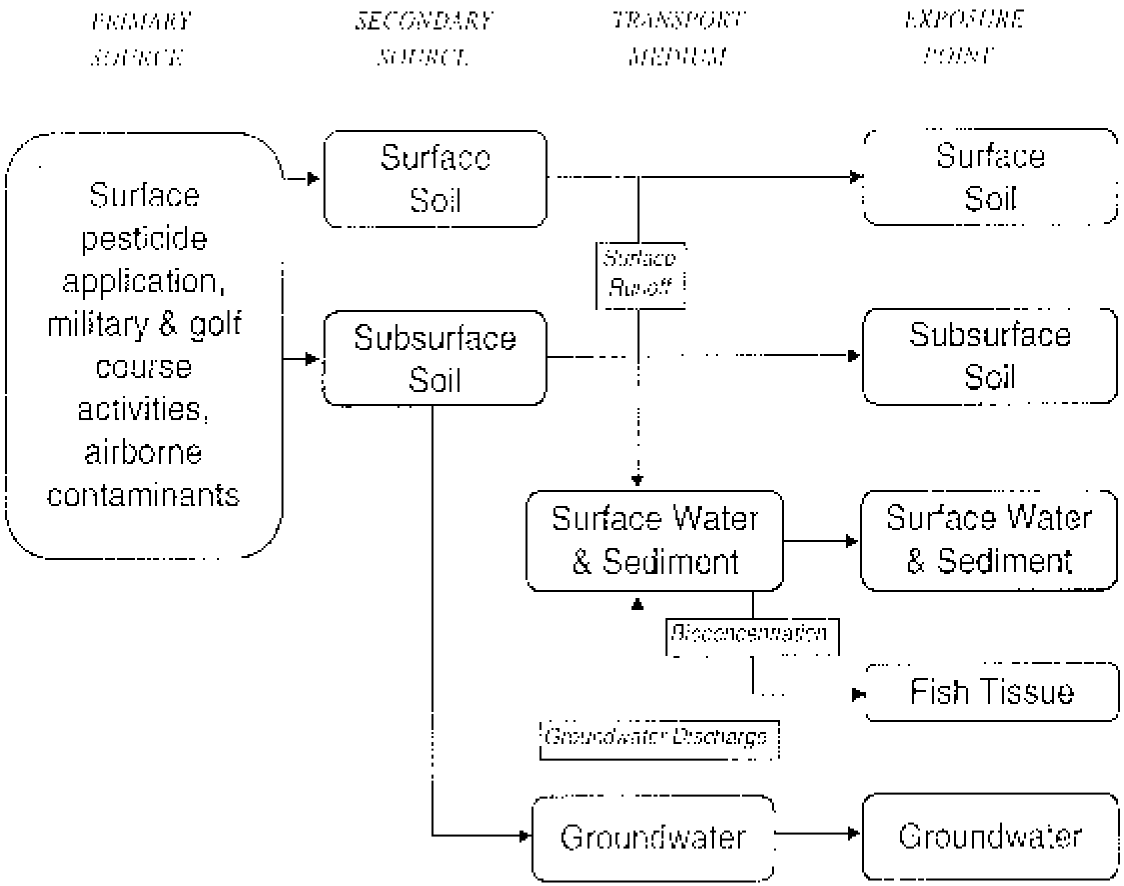
FIGURE NUMBER
2

ARCADIS

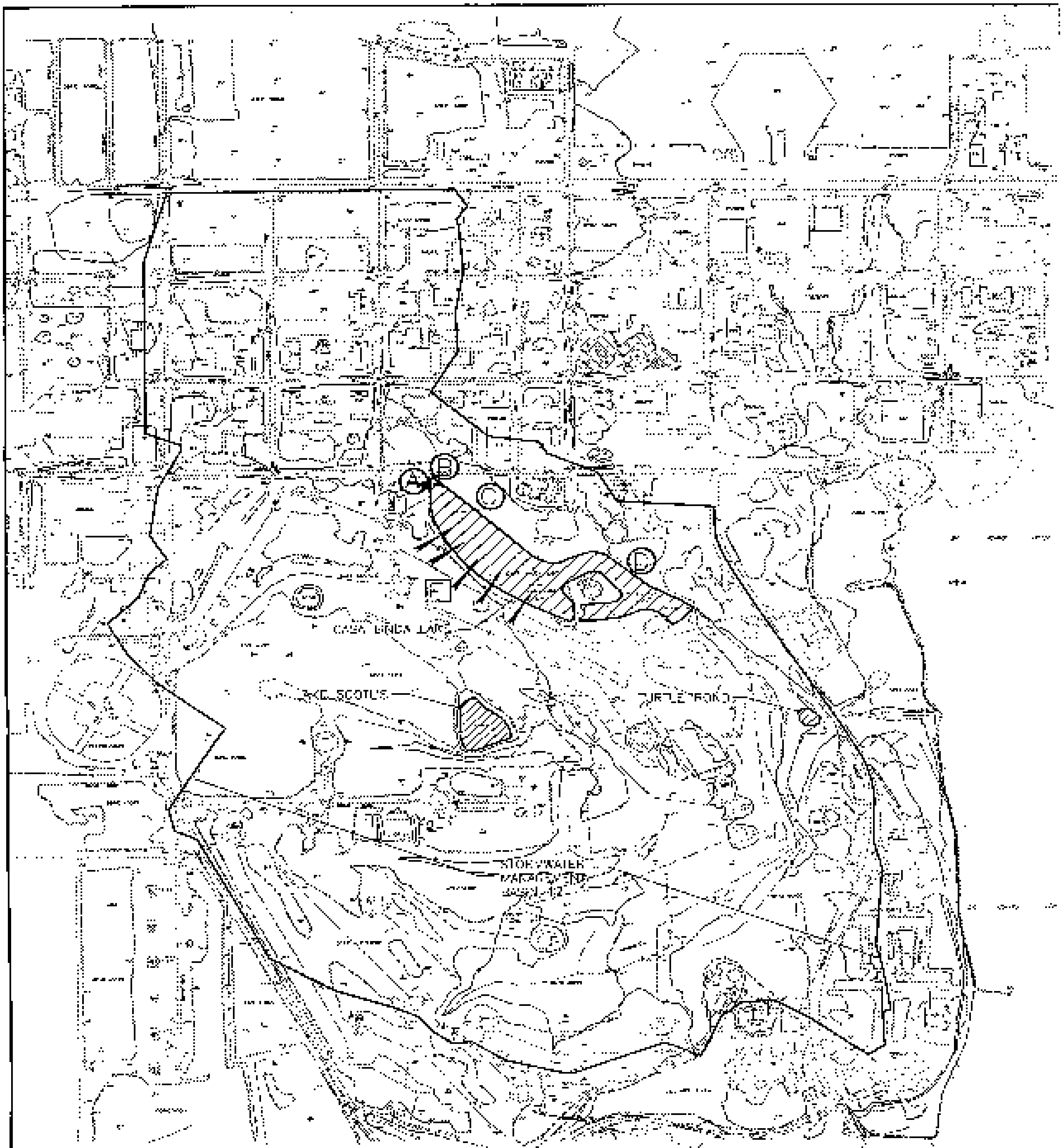
FIGURE 3

Conceptual Site Model for Potential Exposure

Casa Linda Lake, Naval Air Station, Jacksonville, Florida



Exposure Point	Exposure Route	HUMAN CURRENT / FUTURE: MAINTENANCE WORKER	HUMAN CURRENT / FUTURE: GOLFER	HUMAN CURRENT / FUTURE: OFF-SITE RESIDENT	BIOTA: TERRESTRIAL	BIOTA: AQUATIC
Surface Soil	Oral	•	•		•	
	Dermal	•	•		•	
	Inhalation	•	•		•	
Subsurface Soil	Oral					
	Dermal					
	Inhalation					
Surface Water & Sediment	Oral	•	•		•	•
	Dermal	•	•		•	•
	Inhalation	•	•		•	•
Fish Tissue	Oral			•	•	•
Groundwater	Oral					
	Dermal					
	Inhalation					



NAS-97.DWG

EXPLANATION

STORMWATER DISCHARGE LOCATION (PIPED DISCHARGE)

STORMWATER DISCHARGE LOCATION (OPEN CHANNEL)

DIRECTION OF FLOW

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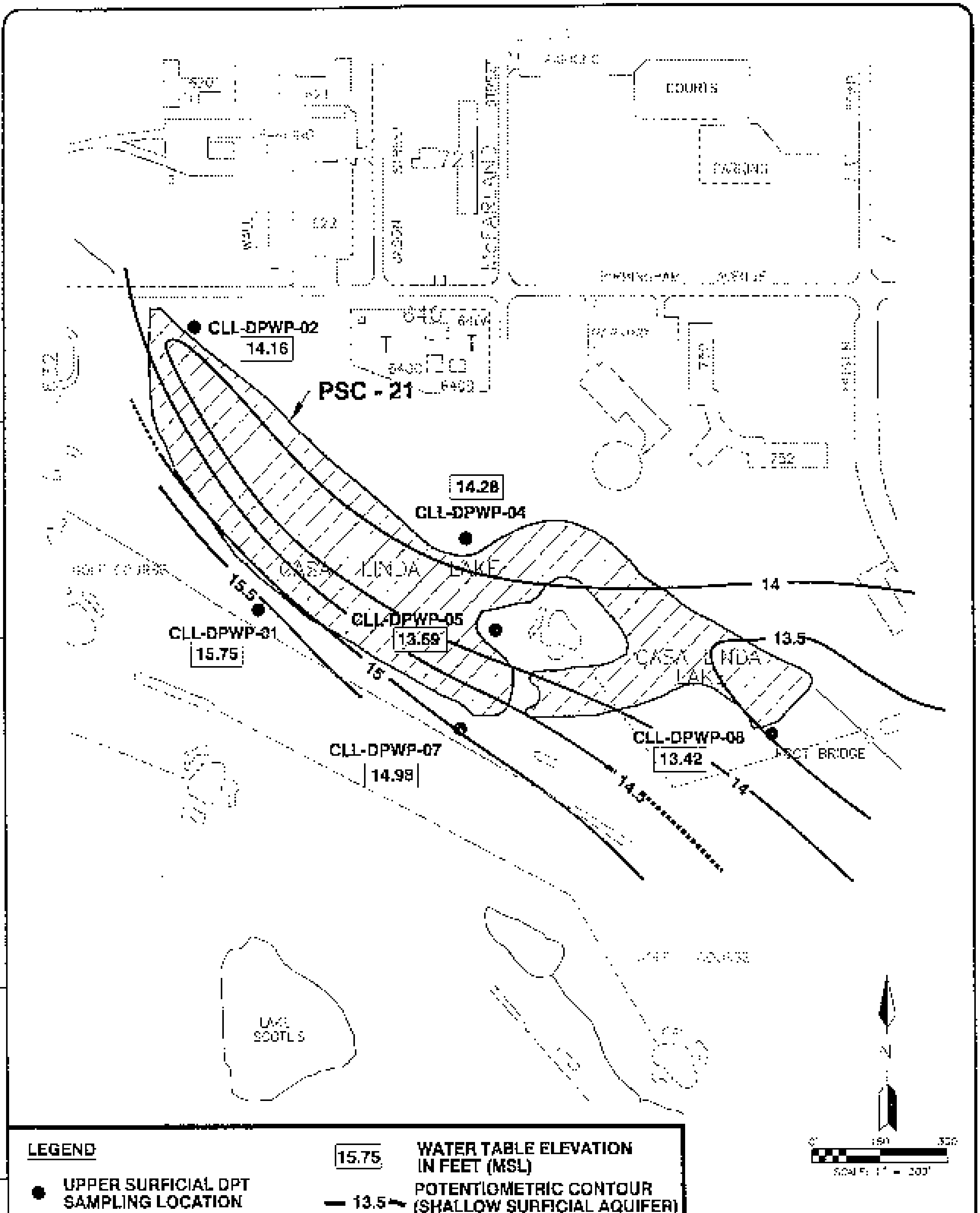
STORMWATER DRAINAGE BASIN 17 AND DISCHARGE LOCATIONS INTO CASA LINDA LAKE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE
4



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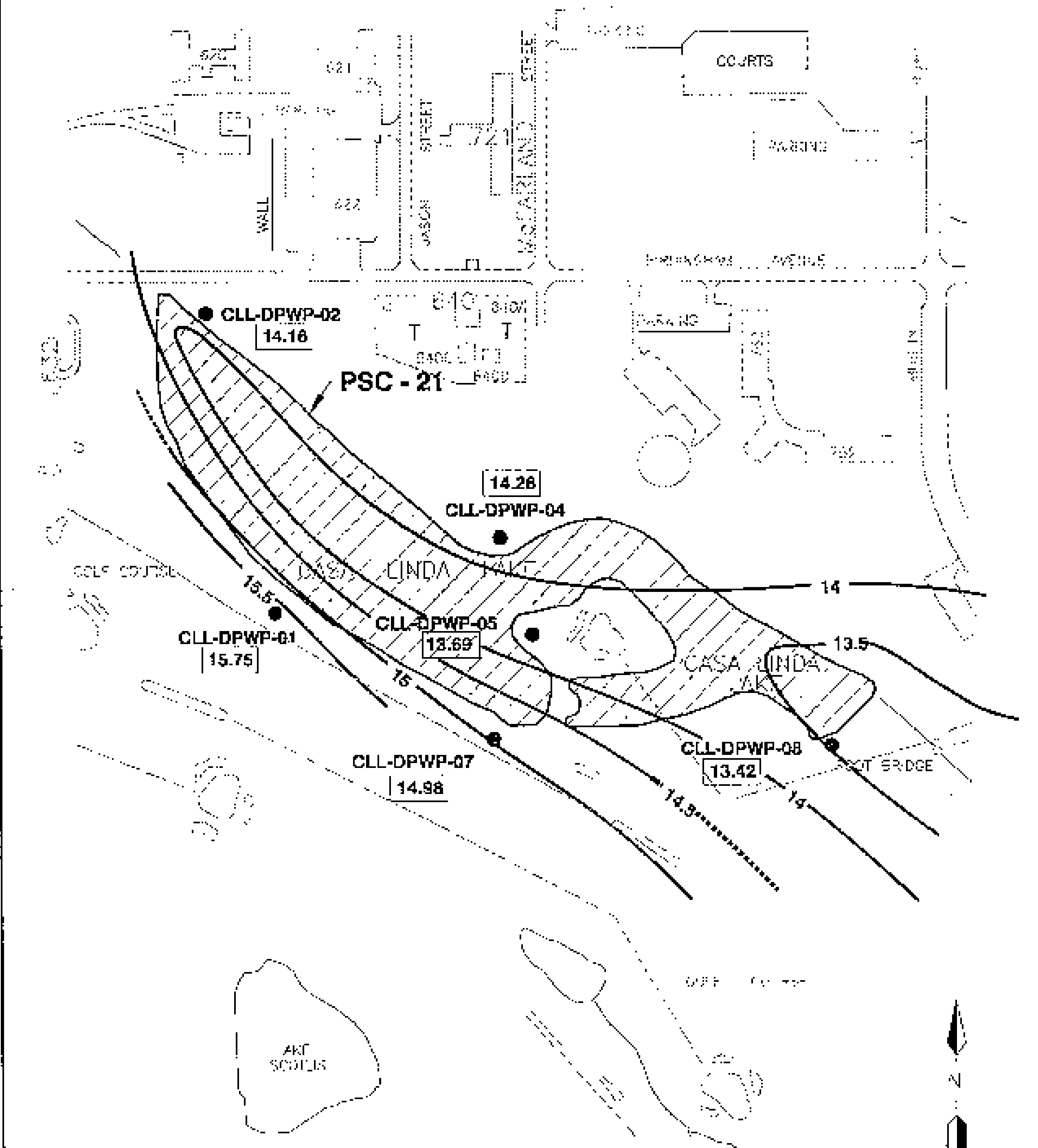
POTENTIOMETRIC SURFACE MAP OF THE SHALLOW SURFICIAL AQUIFER AT CASA LINDA LAKE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE
5



LEGEND	
● UPPER SURFICIAL DPT SAMPLING LOCATION	15.75 WATER TABLE ELEVATION IN FEET (MSL)
	— 13.5 — POTENTIOMETRIC CONTOUR (SHALLOW SURFICIAL AQUIFER)

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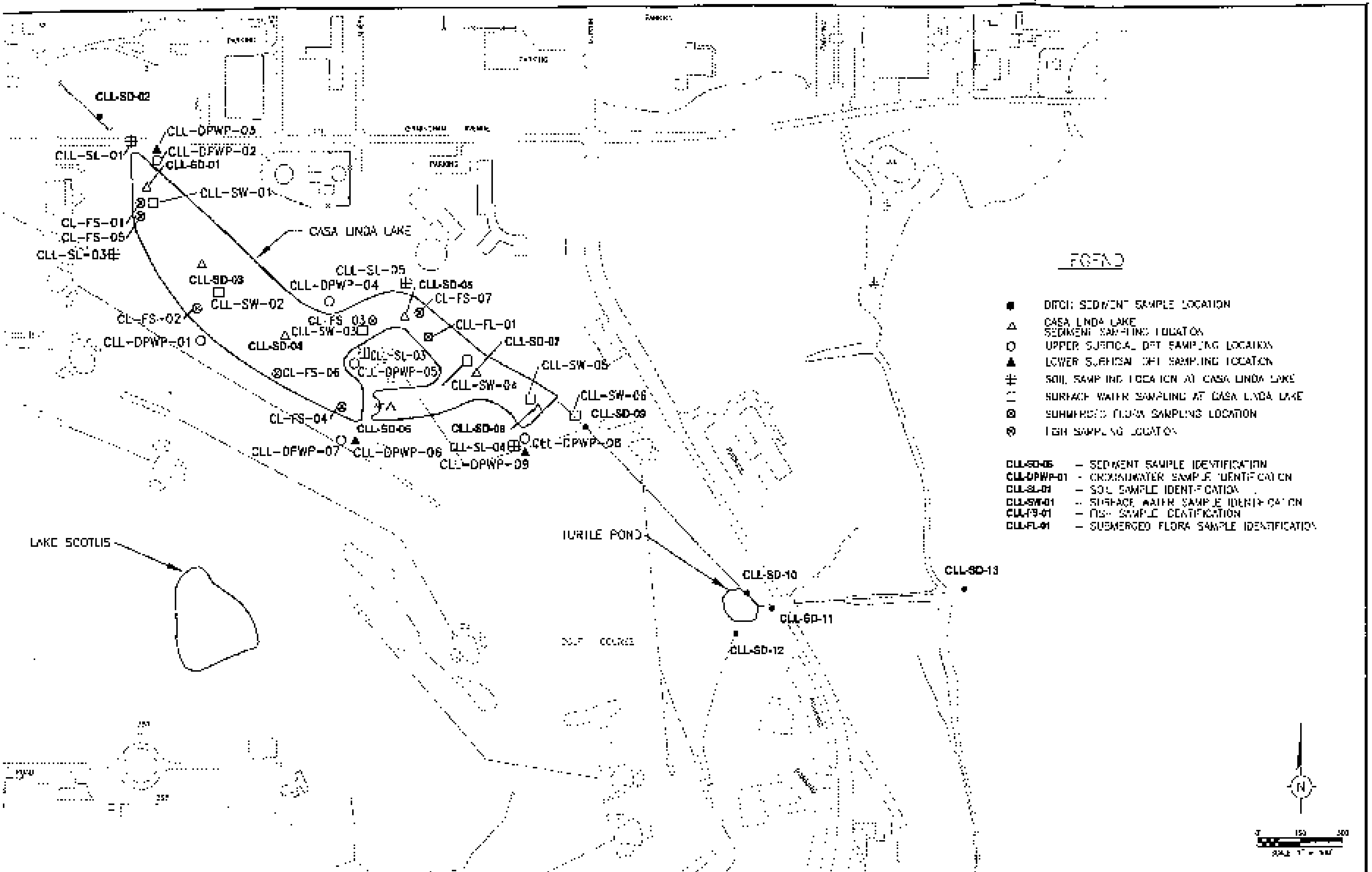
POTENTIOMETRIC SURFACE MAP OF THE SHALLOW SURFICIAL AQUIFER AT CASA LINDA LAKE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE 5



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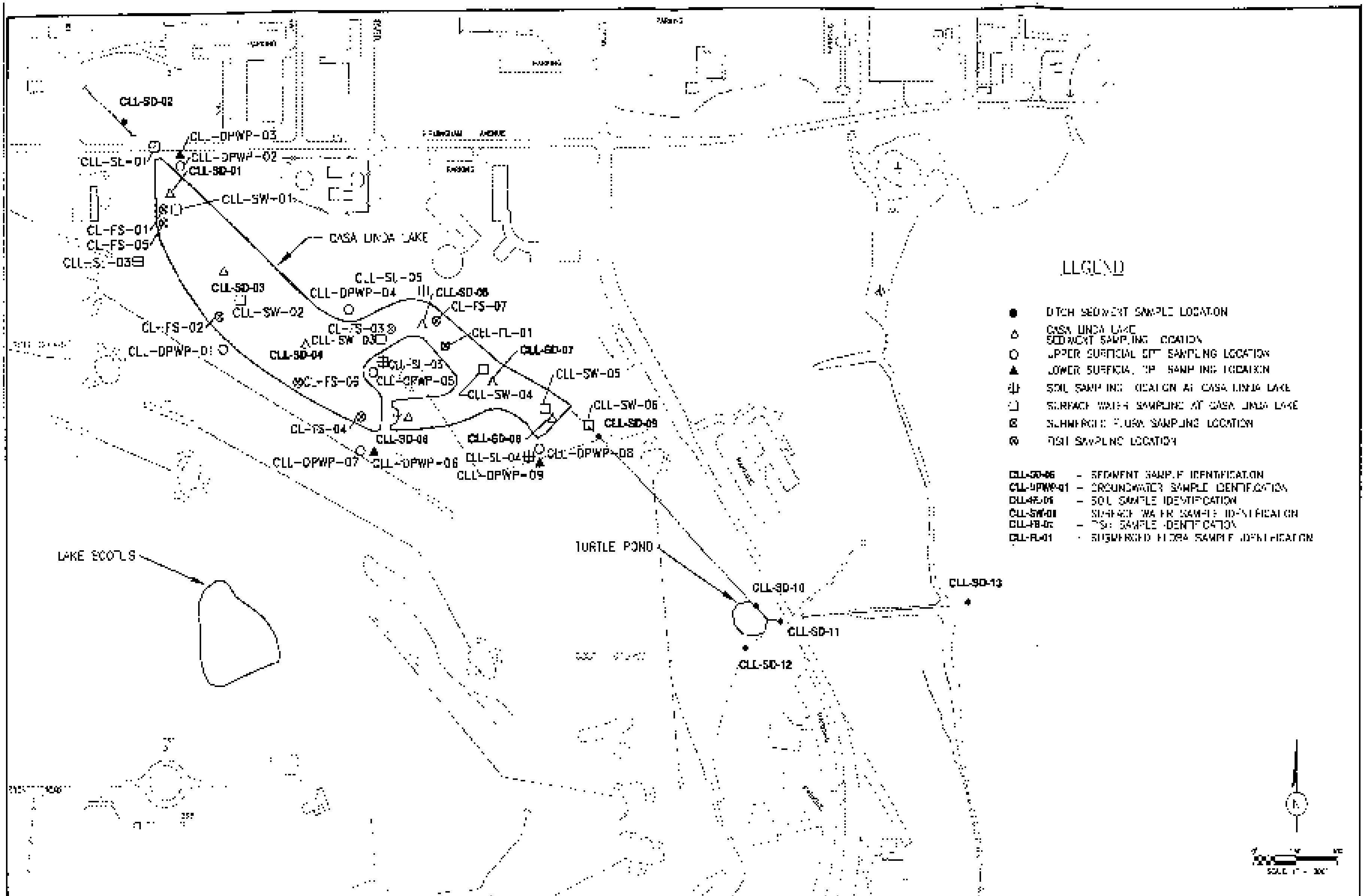
PROJECT NUMBER: FNE07298.0002

REMEDIAL INVESTIGATION
SAMPLING LOCATIONS

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE NUMBER: 7



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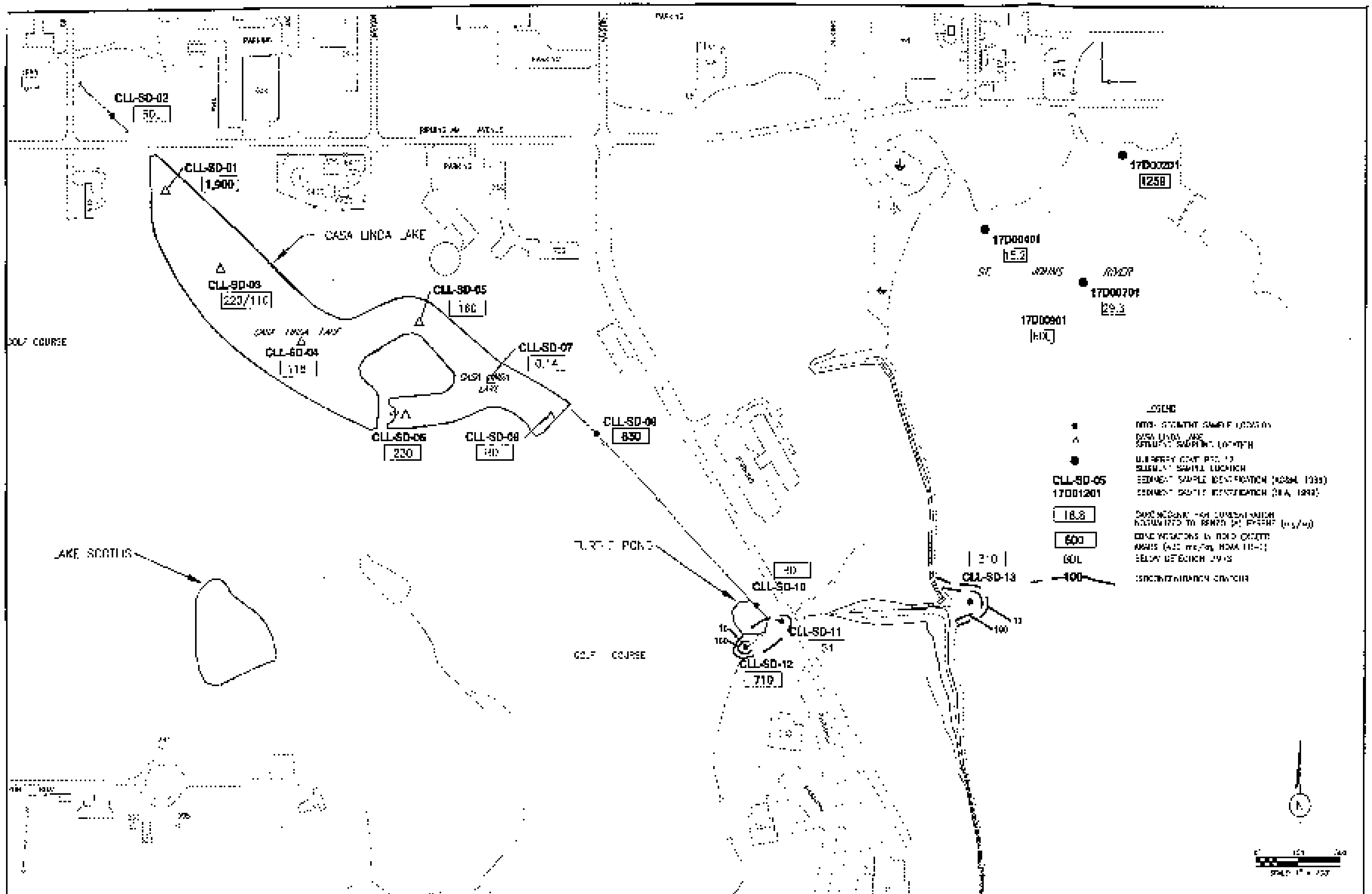
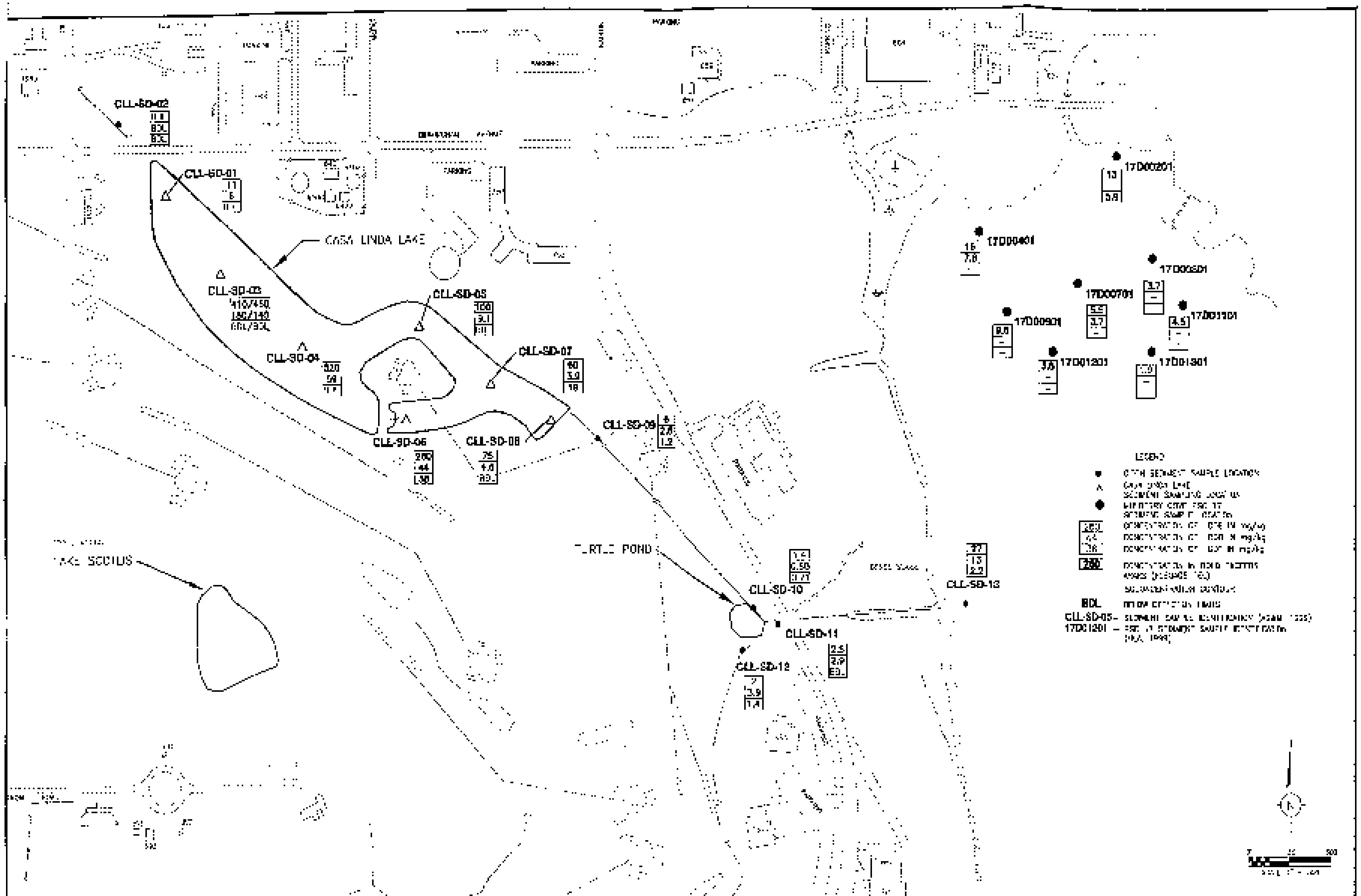
REMEDIAL INVESTIGATION SAMPLING LOCATIONS

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

7



ARCADIS GERAGHTY & MILLER			DISTRIBUTION OF CARCINOGENIC PAHS NORMALIZED TO BENZO (A) PYRENE IN SEDIMENT AT CASA LINDA LAKE & DRAINAGE DITCHES TO MULBERRY COVE
			NAS JACKSONVILLE JACKSONVILLE, FLORIDA
			8



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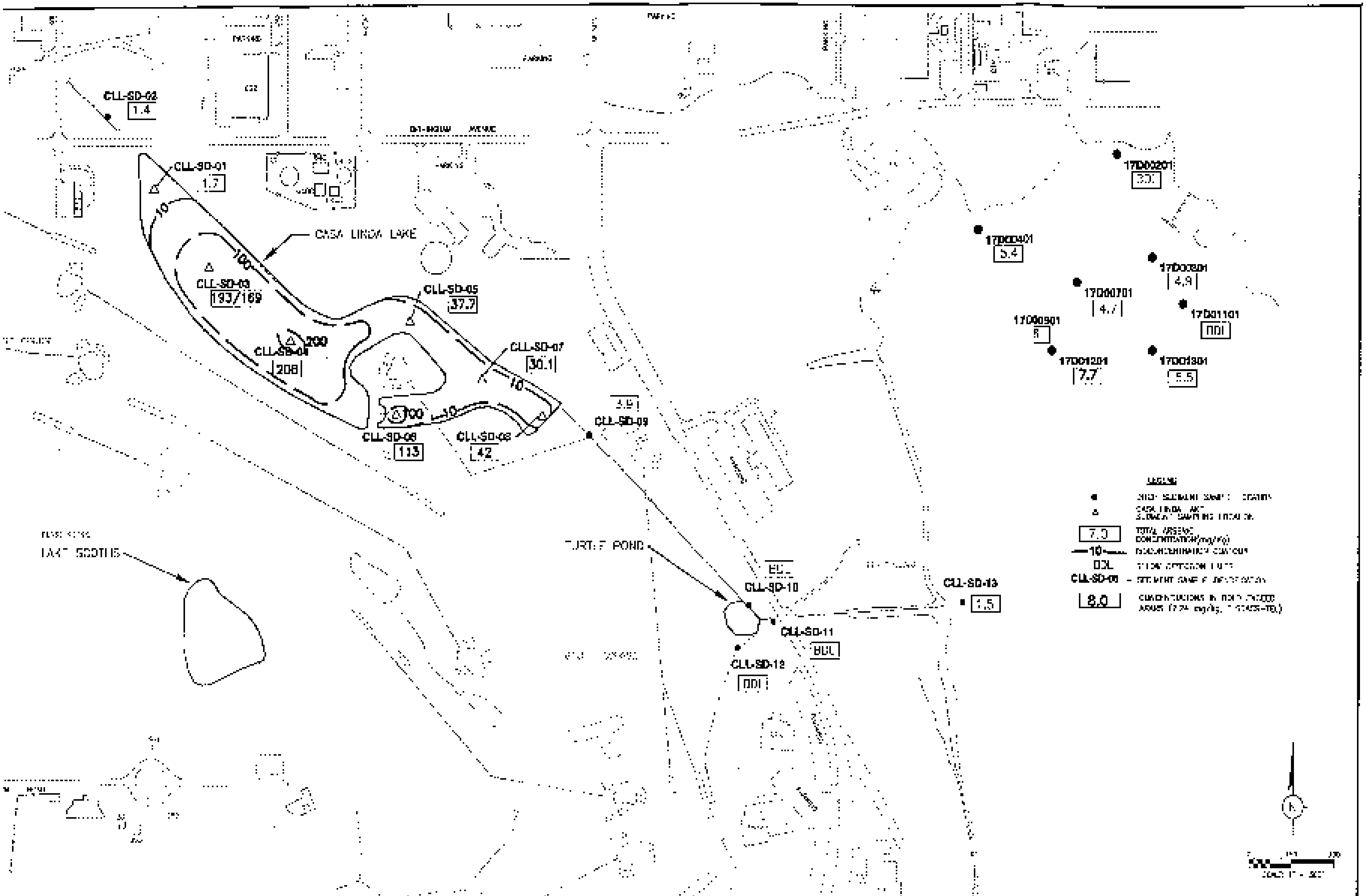
DISTRIBUTION OF DDE, DDD, AND DDT IN SEDIMENT AT CASA LINDA LAKE & DRAINAGE DITCHES TO MULBERRY COVE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

9



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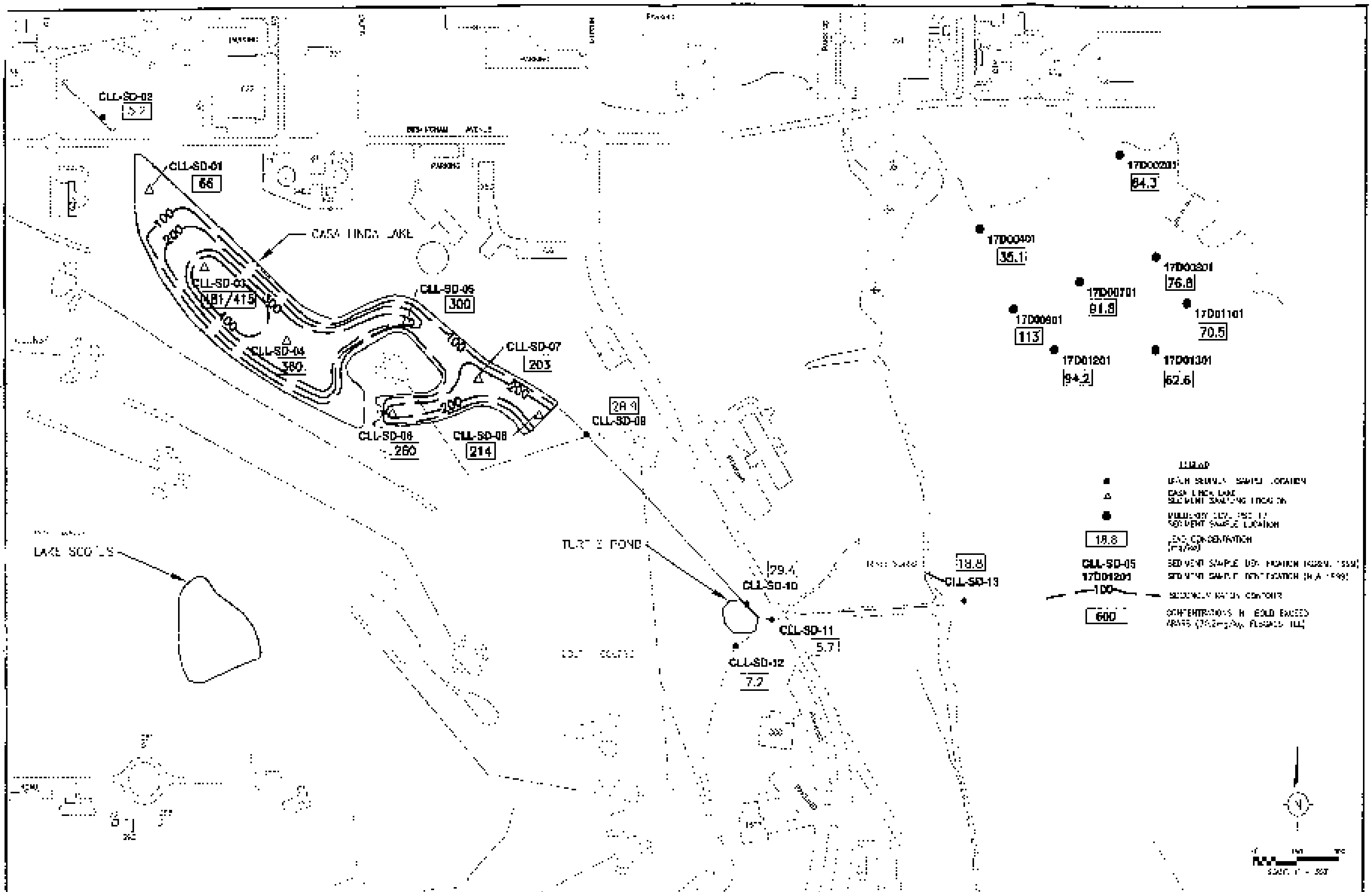
DISTRIBUTION OF ARSENIC IN SEDIMENT AT
CASA LINDA LAKE & DRAINAGE DITCHES TO MULBERRY COVE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

10



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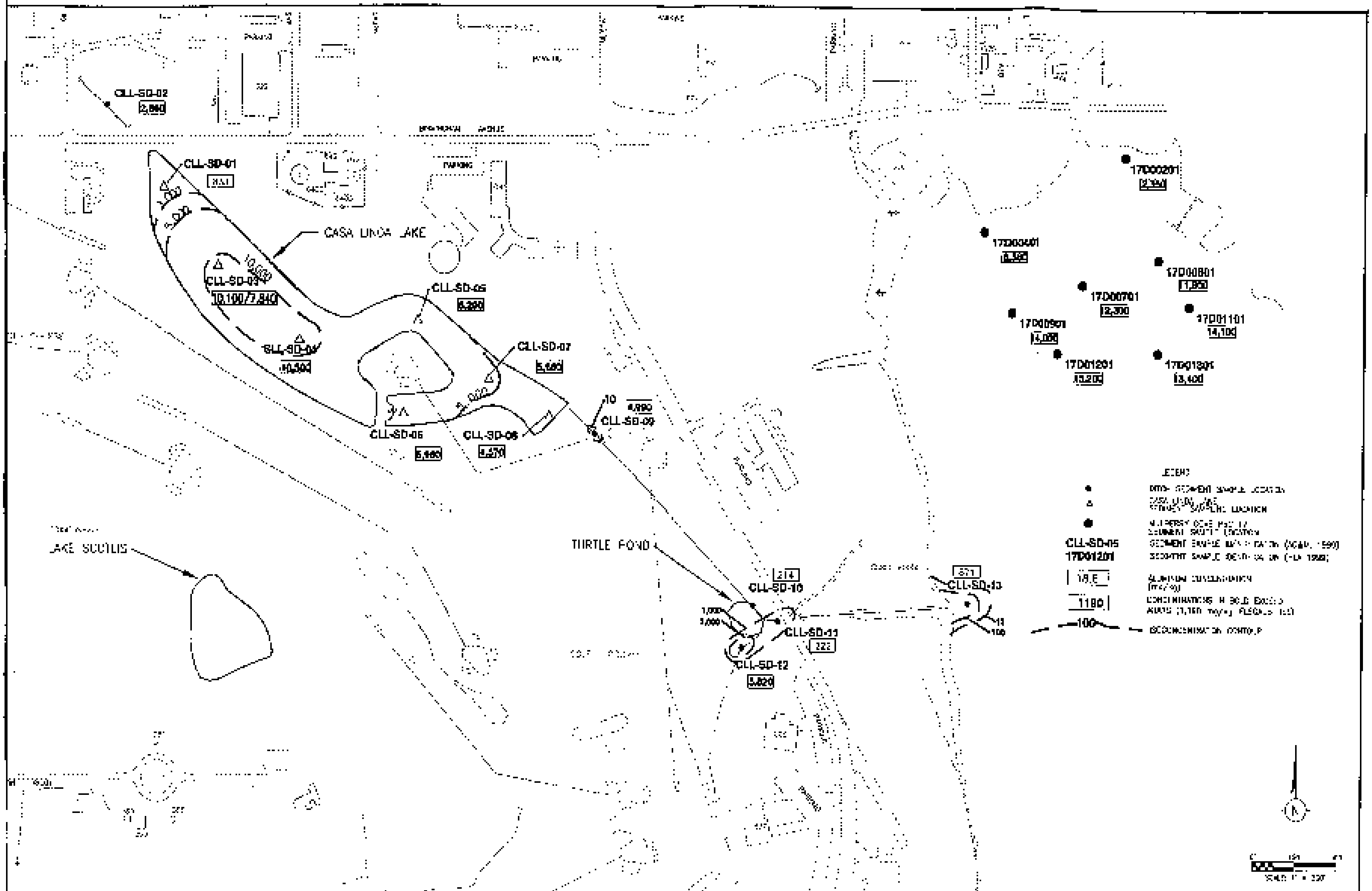
11

DISTRIBUTION OF LEAD IN SEDIMENT AT CASA LINDA LAKE & DRAINAGE DITCHES TO MULBERRY COVE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA



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DISTRIBUTION OF ALUMINUM IN SEDIMENT AT CASA LAKE & DRAINAGE DITCHES TO MULBERY COVE

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

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